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A discussion of Technological Frames applied at an Usability Test

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Abstract

This thesis is a discussion about the concept of Technological Frames. The concept was applied at an usability test in order to investigate how users applied their frames in the sense making process of learning a system. The test was conducted at Cisco's video conference systems, Ocean and T3. The test and analysis proved a high correspondence between usability measurements and technological frames, as frames could answer the reasons for the testers decision making. Technological frames were also an adequate, but not sufficient, analytical tool to investigate the impact the designers frames had on the outcome of the interface. Technological Frames proved it self limited by the concepts own construction, as it saw frames as sense-making devises that functioned as guidelines, only to be applied in similar context as the existing frame. Technological Frames did not look upon the technology itself as a frame, while the findings presented in this thesis exposed that both testers, technology and designers inhabited a set of frames. Due to this, the concept of UF was created, to serve as a dynamic mind-set for investigating the intersection between the three elements. Genres, signs and gestures were applied to the UF concept, in order to assist Knowledge, Experience and Expectations in the process of understanding the interaction between the user and the technology. The UF tool was introduced to assist designers in the process of understanding and designing for their users, beyond the level of usability measurements.

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Chapter 1

Introduction

This thesis is within interaction design, and is a mixture of usability and psychology, emphasizing elements of the cognitive psychology. Usability has an aim of creating user-friendly objects which are efficient to use, easily perceived and learnt. In this thesis usability is strictly focused on user-friendly technology and its goal of creating good technological experiences. From psychology, I have borrowed the concept of technological frames, created by Orlikowski and Gash in 1994. It is a concept created as an analytic tool when examining how people assign meaning to technology.

I have always been interested in the human mind, what affects people to do things in a certain way, and how two individuals create different meaning of the same situation. This interest has over time evolved from concerning the human to human interaction, into an interest of the interaction between humans and technology. We live in a world surrendered by technological devices, from the moment we wake up in the morning, and throughout the day. Usability has become an aspect when items are purchased [Staffer, 2007], and through the last years, it has become an increasing topic in social settings. My interest in the interaction between a technology and its user is whether it is the device that makes us act in one way or if it is our preset knowledge that affects our actions.

I wanted to investigate the reasons why people react in certain ways when presented a technological device that they had not seen before. I was curious about what affected how a person approached an item, and how the person gained understanding of it's use. I was also interested in the conflict between the designer and the user, where one part, in this case the designer, perceive a design solution as logic and self explaining, while the user, look upon the same solution as confusing and conflicting. The interest evolved from the possible conflict between the groups, into what the individuals both perceived differently and shared, between the groups, and within the each

group. Orlikowski (1994) has a good illustration of an approach towards a computer mouse, from a person who had never used it before; «...a user picked the mouse up and tried to use it by pointing it at the screen as if it were a remote control device.» Orlikowski and Gash [1994] The example is from the beginning of the 90's, and most people are more familiar with technological devices now than back then, but the example underline the significance of how we bring with us what we have learned one place to the next learning situation.

1.0.1 Research questions

This master thesis have given me the opportunity to investigate my interest in human computer interaction. As I was working at Cisco (earlier Tandberg) last summer, I was allowed to build a case study around their telepresence systems, Ocean and T3. I had an hypothesis that the system could be seen as a representation of the designers frames, and that through applying a usability test, the testers would have to use their own frames in order to understand the designers logic and frames. As a method to detect the users reasoning processes, I saw unstructured interview as a tool. Throughout the test, it was important for me to talk to the testers, as an unstructured interview, in order to know more of how they reasoned. Based on this, I created the first research question:

- How can usability methods serve as a tool to detect both the users' and the designers' technological frames?

In order to examine the elements that usability measures did not cover, but was important for the design and use of the systems, I had to dig deeper into the concept of technological frames. At the same point, it became evident that the designers had to be included at a larger scale. The following question was introduced:

- How can technological frames be used as an analytic tool for investigating the use and design of Cisco's telepresence system Ocean and T3?

The research questions stated above will be answered one by one, and lead to a proposal of an different mind-set for understanding the interaction between the subject and the object. The usability test will provide insight in the technological frames of the testers and the designers frames. Through applying interviews with both the designers and the testers, I got more information about their frames, such as where they came from, and how they can be grouped. The practical methods which have been used to gain information, will be described in the introduction and in chapter two, while

the theoretical methods will be described as the thesis evolve. I will end the thesis by proposing a tool that is useful when learning about the user-group.

1.1 Limitations

Throughout the thesis, I will speak of concepts such as knowledge, understanding, expectation, genre and experience. These are all large fields, and due to my time limitations I have not been able to take a deep dive into each concept. I have focused on what I have found useful, aware of that there may be other interpretations that would be of value, that is not included.

Given that I have chosen case study as the methodology, I have chosen to use interview and usability test as methods to conduct my study. The usability tests had two different purposes. The first one was that Cisco needed a round of testing at the design. The second purpose was this thesis. This last part will will be focused at in the thesis, and I will thereforee not give much consideration to usability at a theoretical level, but as a tool to gather information.

In this thesis, sociology is left out of the scope of technological frames, focusing on the psychological perspectives of how frames operate in terms of usability. In Norway today, we live in a society surrounded by technological devices which affect how we understand our lives and work. Focusing at the organizational perspective has more constraining effects than facilitating effects, as it leaves out the objects used on an everyday basis, which in turn can be more relevant when understanding the genres of a subject.

This thesis is tainted by the fact that I am affected by my own, existing frames. They have served as limitations and facilitators for my work, both conscious and unconscious. They have affected the choices I have made, from the beginning of the usability test and throughout the assignment. My frames have probably affected how I first created my interview-guide and usability scenario, thereafter how I understood the data form both the usability test and the interviews. Later on which literature I have seen as interesting, and how I have applied it to my interpretations of technological frames. Through the process of working with this thesis I have re-framed, and created new frames, which has affected my interpretation of the literature and the data.

1.2 Chapter Overview

This is a short summary of how my master thesis is built up, chapter by chapter.

Chapter one: Introduction about the thesis and the problems addressed. Introduction to the systems applied at the usability test, and usability methods.

Chapter two: Method concerns the methods used in the assignment, as well as describing the applied methodology. Ethics, privacy and laws are also brought up in this chapter.

Chapter three: Usability Test is a description of the usability test that was conducted with its results.

Chapter four: Technological frames describe the theory behind Orlikowski and Gash's concept, and applying the information gathered from both the designers and the testers.

Chapter five:The elements of Technological Frames dig deeper into the elements of Orlikowski and Gash's concept, in an attempt to understand more of its content.

Chapter six: Deeper understanding of Technological Frames is the discussion chapter. The elements from chapter three, four and five are brought together, and found a different perspective of the concept. It also include a section for next time, introducing the tool created for better understanding of the user group.

Chapter seven: Conclusion is a summary based on the previous chapter. Along with the research questions given in this chapter, a conclusion is given.

1.3 Introduction to Ocean and T3

I will now give a short introduction to the systems applied at the usability test. The systems that was applied at the usability test was Ocean and T3. Both of them are touch interfaces, which implies that the user navigate by using their hands, and touching the elements desired at the interface, without using a cursor such as a computer mouse. Both Ocean and T3 are video conference systems, designed for creating good collaborative experiences despite different locations. Ocean is a personal video conference system, designed for desktop solutions. Figure 1.1 is an image of how the system looks alike, while figure 1.2 is an image of how the lab looked alike. T3 is a meeting room

solution, designed for creating an immersive meeting experience. Figure 1.3 is a representation of how the testers were seated, and where you can see the conference in action. The screen visual at this image is the system tested. Figure 1.4 is a visualixation of the whole T3 conference room.

Figure 1.1: Ocean

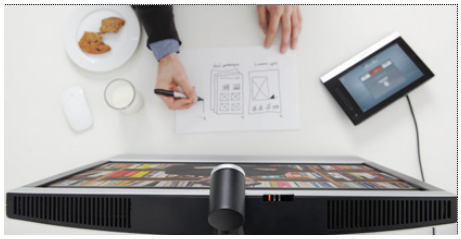


Figure 1.2: Ocean Lab

Figure 1.3: Image of T3, where the interface that was tested is visual

All images used at this presentation of Ocean and T3 are taken from the company's website, and the peoples within are not the same as used in the test. The T3 conference room is exactly the same as used in the test, and the image of the lab is equipped with the same systems as the testers. Throughout the thesis, there will be provided images of the situation in action. Because of a self-view function at the systems, there are several situations described without images. This is due to the promise given to the testers of not using images where it is possible to identify the them.

Figure 1.4: Image of the T3 conference room

1.4 Usability

As stated in the introduction, usability was the starting point for this assignment, and in order to create a sphere for the usability test conducted and described in chapter 3, it is appropriate to provide an introduction to usability and the principles applied at the test.

> "Usability seeks to make products easier to use".
>
> [Garrett, 2003, p.50].

> "User experience is not about how a product works on the inside (although that sometimes has a lot of influence). User experience is about how it works on the outside, where a person comes into contact with it and has to work with it. That interaction often involves pushing a lot of buttons ..."
>
> [Garrett, 2003, p.10].

Garrett states that usability has different meanings to different people. I will add to Garrett's statement that usability is also different, not only depending on the people who are testing or conducting the test, but usability is different depending on what artifact or interface is being tested. Throughout the book "The Design of Everyday Things", Donald Norman highlighted usability as a research area. His perspective was the usability of doors and clocks, but his principles are still of value to day, as his focus is human behavior when working with everyday objects as well as people's practice with them. Normans principles are more guidelines for the designer than for a usability test, but being usability guidelines, they are worth mentioning. Usability and interaction design principles are intertwined, as the one concerns criteria for how to create good usability (along with fancy design), while the other one is how to test the usability behind the fancy design. Norman [2002] basic principles are *affordance, feedback, natural mapping, and constraints.*

Affordance concerns what an artifact allows us to do, through its representation. The concept was first introduced by Gibson in 1979, but it was Donald Norman who made it popular in his book "The design of everyday things" in 1988.

> Affordance refers to the perceived and actual properties of the thing, primary those fundamental properties that determine just how the thing could possibly be used
> [Norman, 2002, p. 9]

This can be exemplified with a chair. A chair affords (is for)sitting, and thereforee it affords sitting. But a chair can also be carried, or turn into a table, the only limitation is the creativity. With all possibilities at hand, it does not necessarily mean that the chair affords being used as a table. Affordance only give hints to the user of how to operate an object. The intention is that the designer is able to send a message to the user of how the artifact was intended to be used through its affordance. The designer should make use of the affordance through his/hers choice of buttons/knobs, picture etc., Norman's vision is that there is no need for a manual to understand an artifacts purpose.

W. Graver wrote an article about technological affordance in 1991. His goal was to emphasize the strengths and weaknesses provided to a user through technology. He states that affordance is independent of perception, because affordance is in the environment, whether the user sees it or not. He believes that affordance exists independent of whether it is perceived or not, that it is inherent in its artifacts, and must be perceived in order to operate the artifact. To make affordance perceptible, is adaptive when designing systems that should be easy to use. "Perceptible affordance are inter-referential: the attributes of the object relevant for action are available for perception" Gaver [1991]

Feedback It is important that the user gets a response to his action. "This includes feedback to acknowledge the action the user has carried out with the product and feedback as to consequences of any action. " Jordan [1998] Shneiderman and Plaisant [2009] also emphasize that feedback should be given after every action performed by a user, and argues that feedback can be given through visualization with change of color,contrast or light. It can also be given through sound or action, such as vibration. If there is a lack of feedback, the users don't know if their actions were noticed.

Natural Mapping refers to the relation between two or several things. In the case of interface design, it is the relationship between a control and its resulting function. Fadeyev [2011a] It can be the relation among buttons on a screen, or to use Normans own example, the relation between a steering wheel of a car and the way the car move the same direction as the wheel is turned. Norman [2002]. Norman states that natural mapping leads to immediate understanding.

Constraints The main function is to constrain unintended actions, or prevent errors through forcing functions. Norman [2002] A constraint narrows down the options given to the user, and will thereby help him or her focus on their real tasks. Pendse [2008]

The discussion of usability has evolved since Norman first published in 1988, and to day there is an emerging discussion of relevant usability issues for touch-interface. Most of the usability principles for the web are valuable when designing for touch-interfaces, but as the interaction has been moved from operating through tools witch the designers are aware of and can control, we interact directly through our finger-tips at a touch-interface. This is a challenge for the designers, who need to be even more focused on the user's mind and behavior than before. Due to the fact that touch interface is relatively new in the market for common users, there is little usability literature on it; most of it is on web, through blogposts and a few online digital libraries. Paul Holter has written a blogpost on what he sees as the most important elements when designing touch-interface. His most important features were: clear visual communication, audio or/and mechanic feedback and avoid unintended actions (affordance). Holter also emphasized that one should avoid small buttons, as different users have different size fingers, and as the level of presiding should not matter. To assist with this, Holter emphasized spacing between each button. Another feature important for touch is to visualize the interaction areas, so that the user understands where to press, and what are actions available. Holter's final point is consistency, and I will give it some proper space here, like the other elements.

Consistency allows the user to get to know the interface and the logic behind it. [Fadeyev, 2011b]. It means that similar tasks should be performed in similar ways.[Jordan, 1998]. Not only because it is relevant for general usability, but because touch-technology is fairly new and unknown for the mass market, and thereforee its conventions are not well established yet.[Holter, 2010]. Through consistency, the user is able to generalize from what has been learned when performing one task to help archive the next task.[Jordan, 1998] Consistency is important to make it as predictable as possible for the users who are unfamiliar with the technology. Dealing with touch interfaces, both efficiency and learnability is highly intertwined with consistency. In

order to be efficient, the user must find the wanted functionality where he or she expects it to be. If there is a little or complete lack of consistency, the user will have trouble being efficient when performing a task. In the matters of learnability, consistency is relevant to how fast a person is able to understand or learn how a system functions. Fadeyev [2011b] has another approach to consistency. He argues that the context should be preferred consistence. His argue is that "context dictated what people need, and indeed expect to see in any given UI [user interface] screen"Fadeyev [2011b], and that the user should only be presented with what is required for the goal of the task. He further argues that less clutter makes the interface quicker and easier, hence, easier to achieve efficiency and effectiveness.

Within the UX environment, there are several models for testing usability, and several methods to follow when testing usability. Testing usability can be hard, as Rubin and Chrisnell [2008] states; it is hard to know exactly what is usability, because it is only visible when its presence is absent. [Rubin and Chrisnell, 2008, p.3]. The author's definition of usable is that there is an absence of frustration when using the artifact.[Rubin and Chrisnell, 2008] argue that when a product is usable, the user can do what he or she wants with the artifact, and that he can do it the way he expect the system to behave, hence affordance. This process should occur without any obstacles, hesitation or questions. Avoiding frustration alone, is not enough to say that an artifact is usable, but it is a starting point. There are many factors that plays a role in deciding whether an artifact is usable or not. The reasons may be due to history, culture, beliefs, etc. Rubin and Chrisnell [2008]. Peter Morville created the honeycomb model to define what he saw as the most important usability aspects. (See figure 1.5, the figure to left.) The honeycomb model was created as a method for Morville to convince his clients that usability was important, but has become a credited model of usability testing.[Maier, 2011]. The components are useful, useable, desirable, findable, accessible, credible and valuable. Useful concerns whether the content on a web site is useful or not for the user. Usable is the ease of use, while desirable deals with whether the user finds the web site desirable.[Morville, 2004] Morville argues that icons, brands and identity has an impact of whether a user finds a site desirable or not. Findable relates to whether a user is able to find the wanted information, and is thereby mostly focused around navigation. Accessible concerns whether the webpage is constructed for people with disabilities, and credible deal with whether the site is perceived as serious and trustworthy. Valuable is the last part of the honeycomb, and forms a part of whether the page and its content is of any value, for both users and stakeholders. Magnus Revang has developed Morville's honeycomb, and added several features. His model (see figure 1.5), relies on

the idea that the different cells, or in Revang [2007] term, the facets, develop after experience. He sees value as the result of the user-experience and not as a facet of it.[Revang, 2007] All the small, colored elements at the outer ring of wheel are factors that contribute to each facet, which can function as a check-list for interaction designers. Rubin and Chrisnell [2008] underline that in order to be usable, a system or artifact has to be efficient, effective, learnable, satisfying, accessible and, not at least, useful. Jeff Sauro at measuringusability.com cited the ISO 9241 pt.11 when he stated that "Usability is the combination of effectiveness, efficiency and satisfaction". [Sauro, 2011] I have chosen a set of usability measurements which I will present in the following sections. Several of these can be found in both Peter Morville's honeycomb model, and Magnus Revang's ux-wheel. (see figure 1.5)

Usefulness is how a user is able to archive his/her goals, and how a user perceives the artifact as useful, in order to be willing to try it out. Rubin and Chrisnell [2008] emphasize that if the user does not perceive the system as useful, he or she will never take full advantage of what the system offers. Rubin and Chrisnell [2008] underline that a user will judge a system as useful or not through his/her first impression of the system, and that it will affect the whole experience of a test. Morville's argue of usefulness is a part of this section.

Efficiency relies on how fast a user is able to perform a wanted task, or as Jordan [1998] states it; the amount of effort required to accomplish a goal. He further states that it measures how the level of effort, or how little effort the users have to exert, in order to accomplish the task given.

Effectiveness indicates to what extent a system behaves the way the users expected it to, and how easy the users perceive that the system or artifact is to use. The ISO definition is "The extent to which a goal, or task, is achieved." [Jordan, 1998]. Morville's usefulness section can be seen as similar or equal to effectiveness. Where efficiency is a more black and white principle, effectiveness breaks each task into sub-tasks with fewer goals, and then looks at the total outcome of the whole process. The level of closeness of the components' dimensions vs the ideal dimensions is also important for the total output, as they can be used as a measure of effectiveness. [Jordan, 1998]

Learnability is a part of the user's effectiveness, and concerns the part where a person is able to use the system or not after some time of training. It concerns the cost the user has to accomplish the goal of the task, and the competence level the user exposes or gains when trying to perform the task. [Jordan, 1998]. If the method is proved

easily at the first test, the product is seen as highly learnable for that given task. The level of learnability is important with any interface or artifact, but it is highly important when there is little or no time for training. [Jordan, 1998]. Whether a system is learnable is measurable after the level of success on the other usability requirements. It also refers to the capability of relearning a system after periods of absence. Within the user-centered design approach the learn-as-you-go principle is well established. The thought is that the user will learn the system through testing and using, and that he does not have to understand everything immediately. Jordan [1998] underlines that "recognition-based interfaces tend to be more learnable as users can operate them without having to retain detailed information about the interface in their hands. ... Rather, visual cues prompt the user at the time of use." [Mayes et al., 1988].

Satisfaction refers to the opinion of the user after testing a new device. Whether the user has perceived it a satisfactory concerning eg. time and how easy it was to use or not. This is mostly captured through stories or questioning about the satisfaction. "Users are more likely to perform well on a product that meets their needs and provides satisfaction than one that does not"[Rubin and Chrisnell, 2008, p. 4]

Accessibility was mentioned as a section of Morville's honeycomb. Rubin and Chrisnell [2008] has elaborated the concept, and implemented that it not only deals with designing for people with disabilities, but that accessibility refers to how something gets used, or "having the right tools or system(s) available in order to accomplish your goal". Rubin and Chrisnell [2008] emphasize that if you design for people with disabilities, it will is guaranteed to benefit people without disabilities. The reason is that when you design for people with disabilities, you are more concerned with the specifications, targets are more clarified and design more simplified. An example is designing for people with bad eye sight, the designer will have to think of matters such as the light conditions, the contrasts among the colors in the interface and texture. Possibilities for oral feedback or feedback through the interface's texture, are possibilities. For touch technology, accessibility should be considered for those who have a low degree of functionality in their hands. As mentioned above, under considerations for touch technologies, Holter [2010] argues for large buttons for big and unsensitive fingertips, but if impossible, he argued that a wide radius of pressable area for wanted action.

Simplicity "If your interface looks complicated your users are going to perceive it as difficult to use and expect it to take long time to learn."[Wilson, 2011] John Maeda has a usability principle of simplicity. He has a

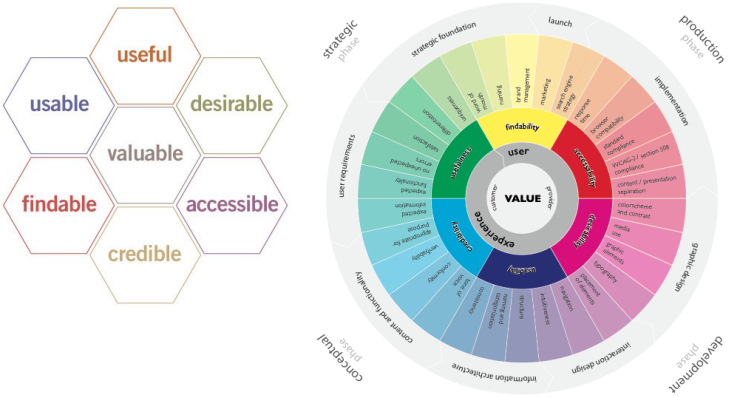


Figure 1.5: Morville's honeycomb (left), Revang's UX wheel (right)

method named SHE; shrink, hide and embody. [Fadeyev, 2011c]. He has created three laws, and reduce is the first. Maeda argue that information visible should be reduced, if not relocated or removed. The second law is organize. What cannot be removed or hidden can be organized into something meaningful. This is in order to make a system appear sparser than it is. Maeda offers the SLIP method to organize. SLIP is an abbreviation of short, label, integrate and prioritize. The third and last law is time. It is based on the same principle as efficiency, concerning how much time you need to perform a given task, but the time aspect also addresses whether it is relevant or not to visualize the time spent, or work progress.

Within usability there are many usability measurements dealing with universal design, to make a system or website usable for all kinds of users, with or without disabilities. For blind people and people with poor sight the size of letters will matter, while for people who are blind, elements such as sound and feedback through vibration or texture will have an impact on experience of the interface.

Chapter 2

Method

In this chapter I will present case study as a methodology along with its suitable methods, ethics and law.

I have chosen a qualitative research approach to this study. A Qualitative approach give foundation for an indebt understanding of the social phenomenon that we study. Thagaard [2006] The study is characterized by a close contact between the researcher and those who is studied. The contact is reached through different methods, most common are interview or and observation. Interview gives knowledge of how a person understands and reflects upon his own situation, while observation is a method for learning about interaction among the participants of the study, or the interaction among the studied and other people. [Thagaard, 2006]. In addition to interview and observation does Thagaard [2006] underline that a qualitative study should contain of analysis of existing documents of the theme in scope, to gain a greater understanding of the subject.

Thagaard [2006] underlines that the researcher has to immerse him/her self in order to gain an understanding for the phenomenon in scope. By immersing one self, the author argues that we will achieve understanding for those who's studied, and their situation. The researcher has to be open minded and receptive for unforseen impressions, which then again can lead to closer contact with the informant's and ideas to reflection of the data. The other side of this is that the researcher will be tainted by the relationship to the informants. Due to this, Myers [1997] underline that the researcher's impression and reactions will influence the analysis of the data and also how the data is collected, and must therefore be considered as qualitative data. Thagaard [2006] emphasizes that through keeping a systematic approach to the data collected, the researcher should be able to maintain a reflected relationship to the study and the process of gathering data, the methods used and the process of analyzing the data. In order to call it a systematic ap-

proach, the researcher have to be able to argue the choices made concerning the different methods applied.

2.1 Ethics, privacy and law

During this study I have followed the Norwegian laws of collecting and storing personal information from Personopplysningsloven (2000). The research has been reported and approved by the Norwegian Social Science Data Services (NSD). All participants of the usability test and interviewees were informed about the purpose of the study, how and where the data would be gathered, as defined in section 19 of the Personopplysningsloven (2000). Following, I have strictly collected data relevant to my study, and only used it for the purpose of this study, see section 11. All informants identities have been kept confidential, and the data has been stored after the NSD restrictions.

2.2 Case study

When I searched for the right methodology to chose, I found case study to be the most appropriate for my thesis as the intrinsic method allows me to investigate one single case.

A case study is characterized as an investigation or research where the aim is to gather information about one specific case. [Thagaard, 2006]. There are many different understandings of what a case study is and what it should consist of. The most commonly accepted understanding what a case contains, is an empirical limited unit, a group or an organization.Ragin [1992] in [Thagaard, 2006, p.49]. Another author, Yin [1994] limit case studies to the research of phenomena that is studied in its natural environment and situations, and where the study contains different data sources.Yin [1994] in [Thagaard, 2006, p. 49]. The focus of the analysis is towards one or several units that represents the study's case(s). There's no limit on what the focus can be, it can be a person, a group or an organization.

There are three different methods of case study. Robert Stake has named the first method The Intrinsic Case Study, which is a single case or process. "Here, the researcher examines in detail a single case or instance of the phenomenon in question, for example a classroom, an arts program, or a death in the family." [Norman K Denzin, 2005, p. 378]. The second approach is to study several cases. Stake has named it The Collective method. Each case is studied "in terms of specific and generic properties."[Norman K Denzin, 2005, p. 378]. The third case study approach is where the researcher

investigate several different cases, aiming at making a generalization of them.

There is discussion about what methods defines a case study, and which that is the most appropriate to chose. Denzin and Lincoln state that "a case study, for example, relies in interviewing, observing and document analysis. "[Norman K Denzin, 2005, p.379] Due to the fact that I have chosen a qualitative approach to this study, interview and observation are natural choices. Crang and Cook (2007) states that it is normal with *triangulation* in case study, where one method is used to confirm the insight from the other one. [Crang and Cook, 2007, p.128]. This may be a combination of interview and observation, combined with document analysis or a questionnaire. Blomberg et al. [1993] conducted a study about American mothers and how they view upon their children's growth and learning process. She found that it was common among the mothers to tell about abilities they believed their children possessed, which was contradicted after sessions of observation. Blomberg underlined that the mothers did not intend to lie to her, but due to the cultural convention of which abilities a child should know by a given age, the the mothers believed that their children should know by that time, and therefore told the researcher that their children possessed certain skills. This study underlines the relevance of using both interview and observation as techniques, because people don't do and say the same thing.

2.3 Interview

2.3.1 Creating the interview-guide

There are three classical ways to create an interview-guide. It's the non-structured, semi-structured and structured interview-guide. A non-structured interview-guide is, as the name implies, fairly unstructured, where the interview is more like a conversation between friends where the theme is set. A semi-structured interview-guide is "where the researcher and participant(s) set some broad parameters to a discussion." [Crang and Cook, 2007, p. 60]. A structured interview-guide function more as a questionnaire, where all the questions are predetermined in a specific order. Which one to chose depends on the aim for the study and interview. The non-structured can provide information that you did not expect, and thereby put your research in an other perspective. If the person is silent, and answer most in yes- and no terms or as little as possible, this method can create difficulties. A semi-structured interview-guide gives you more pins to sort the information after, and can come in handy if the interviewee isn't that much of a speaker. If the interviewee talk's more freely, one can use the interview-guide as a schema to cross out as the conversation evolve, and as a tool to steer the conversation. This is a good method if you know what you are aiming at, but want to

keep the door open to unknown matters. If something unexpected appears, the researcher should ask more questions about it, and be able to focus on the unknown and find out as much as possible about it, instead of clinging to the guide. A structured interview-guide works more as a questionnaire, where the interviewer controls the conversation in a higher degree than the two other methods. This is good if you have a hypothesis that you want confirmed or disproved.Crang and Cook [2007]

Finding questions that give you the information you want need considerations. It is hard to separate when to dig further and ask more thorough, and when to stop in order not to become a *persona non grata*. Crang and Cook [2007]. Personal questions or question that concerns dilemmas in the organization can make people nervous, awkward and embarrassed. Crang and Cook [2007].

2.3.2 Methods to use when documenting the interview or observation

There are different methods of documentation to use while interviewing or observing. I will present the most frequently used.

Notetaking

Notetaking is a tool that can help you remember the highlights of an interview. Some people prefer to take a lot of notes while others don't. If the notebook is your only tool, you rely a lot more on the notes than if you have a audio-recorder to rely on as well. Notetaking can be a good supplement to audiorecording, noting the most important things that are being said, or thoughts and associations you get when the interviewee is talking. An issue for the interviewer is to balance between taking sufficient notes, and keep focused on what that's actually being said, and able to ask follow up questions. A problem is also that the interviewee can be stressed by continually being quoted in such an expressed and open way. That constantly reminds the interviewee of the setting, and can create an unnatural setting when the interviewer looks down and is busy writing.Crang and Cook [2007]

As I conducted the usability tests, I made notes every time something unexpected happened. This is something that is also recommended by Crang and Cook. I wrote comments to the test-persons actions and facial expressions, which I thought would be good to have when I wrote my report. After only a few tests, I found out that what I had noted ware also the situations that I reacted to when looking through the video a day or a week after. I also saw that while I had been focused on noting something interesting, I

often missed out of other situations that I should have asked more questions about. I thereforee changed my questions papers into a few points that was essential for me to notice, and crossed them out as the tasks went by. This was a more successful way for me, also because my test-persons were not as distracted by me making a cross compared to when writing sentences. Crang and Cook states that the researcher should make notes of what happens outside focus of the camera. thereforee I noted when I saw hesitation, or special facial expressions. When I wrote my report, I found that most of what I had noted as body-language outside the lenses was also documented at the camera. When a test-person reacted to something, he or she hesitated with his/her hands, preventing themselves from pressing at a button, pulling their hands back or other actions that made me aware that they did not know what to do, or thought something was abnormal. I tried to ask questions on the flow, and thereforee, I have the conversation on tape as well as their action. Based on this, I found my notes slightly unnecessary when most of it was documented in the film.

Audio

The strength of audio recording is that it enables you to keep your focus on the interview, what that is being said and where to ask follow up questions. Another strength is that having something recorded gives you the opportunity to recapture the whole interview as many times as you would like, and to get back and listen to things you were uncertain of during the interview, and thereby perhaps straighten up misunderstandings. On the other hand, depending too much on the audio record can be a disadvantage. If the interviewer rely too much on the audio recorder, and think that listening through the interview later on will provide a better understanding of what the interviewee talked about, can be disproved by having a interview and a story that does not make much sense.

The strength given by the ability to recapture the interview, can be perceived as a threat for the interviewee. Being aware that the whole conversation is recorded and is in an other person's possession, can be perceived both as a threat and frightening. Crang and Cook [2007]. People may thereforee be recessive about the information that they give, avoid answering questions that they feel threaten by, or demand the audio recorder is turned off while answering some questions. As a researcher it is thereforee important to let the interviewee know who will have access to the interview, how it will be stored, and be open on that the interviewees rights. Throughout this study all audio and video records have been stored after the Norwegian Social Science Data Services (NSD) requirements.

Physical obstacles such as fully charged batteries and a sufficient volume level on the recorder is important in order to be able to listen to the interview later on. The researcher must also consider where the interview should take place, and whether an audio recorder is the right to use. Crang and Cook (2007) recommend that you immediately after an interview listen to it, to make sure that you got on tape and with a satisfaction quality. If the quality is not as expected, Crang and Cook strongly recommend to start writing down the interview as soon as possible, in order to include as many highlights as possible. When the quality of the sound is as expected, one does not have to rush to start transcribing, except for the sake of the timeline of the project. When transcribing an interview Crang and Cook states that it is important to include everything that's been said. This is because you can get an understanding of a situation or a story in the interview, while reading through it later on. It is also important incase the interviewer has put words in the interviewees mouth, that can have effect of what the interviewee say's next. It may not be that easy to discover while the interview is on, but on text it can become more evident, or at least easier to uncover such situations. Probes such as "hmmm", "emmm" etc are also valuable to include, because they reflect how the interviewee think's, and need to take pauses to think before answering. Crang and Cook [2007]

Video

A lot of the features that are relevant when audio recording, are relevant when video-recording, and sometimes amplified. In a video it is more difficult than in an audio tape to make a person anonymous. When interaction is documented, there are often body parts involved, which can reveal personal marks, such as tattoos, birthmarks, moles, freckles etc, but also jewelry. When I conducted my tests, the cameras were always focused at the interface, but it was possible to see the hands of the test-person, as they interacted with the interface.

Using camera as a tool to record a situation is good when documenting how a person works, while an audio recorder is sufficient when you want a person to describe how they work. In a interview situation it is rarely necessary to film, while it is necessary if you are examining how a person makes use of a tool. Crang and Cook (2007) marks that using a camera is probably more expensive than an audio recorder. Not only the expense of buying a camera, but also the extra devices that you need in order to handle the files. I borrowed filming equipment from Cisco, while technical features, such as a program for handling the files, and a program for playing the files became a problem for me, as I did not have a computer suited to handle the video files, and the standard program was not compatible with

the format the video was recorded in. I spent time searching for an appropriate converter and file handling program, which became rather frustrating. I also experienced that the format of the video was important, when I once borrowed a camera with poor resolution.

I was made aware of by a colleague at Cisco that the size of the camera plays a role in what attention a person gives it. Normally a researcher wants the situation to be as normal as possible, and the physic of a camera has affection on this. A small camera is easier to forget, and not pay that much attention to than a large one that you constantly see. The position of the camera is necessary to take in considerations. If it is placed at a spot where the test-person or interview object constantly see it, he or she will constantly be reminded of its existent. At Cisco, one of the designer found that the size of the camera had an impact on what attributes the participant gave the camera. A large camera symbolized a high level of seriousness, while a small flip camera didn't seem to have much affection on participants. I used a 15 cm high and 10 cm wide flip camera during my tests, and had a good result with it. The quality of the movie were sufficient, and the sound was good.

While documenting with a camera, the researcher need to evaluate the context.Crang and Cook [2007] If it is important to hear, and not only see, what is being done and said, the background noise have to be taken in consideration. If the interview take place in a noisy environment, audio and video recorders can be difficult to use; the microphone record all sound, and does not single out the ones we are interested in, and thereforee it is necessary to evaluate if the room or situation you will conducting the interview at can be too loud so that you will not be able to hear you interview object later when transcribing. Places that can create difficulties are such as a factory, a café, outdoors at a blissful day, etc. Anyplace where there is a lot of people and sound, either from machines or other people talking. It can be more difficult to sort out other peoples conversation than a machine with a constant sum in the back, because the non-human sounds of a machine is easier to sort out than voises. The light does also need considerations before filming. If the sun is reflecting in the camera, it can be difficult to see the person or action documented. The light conditions are thereforee important to check before filming.

2.4 Selection of people

I have tried to do a *strategic* selection of people for both interviews and usability tests. A strategic selection is when we chose informants that we believe contain abilities or qualifications that are strategically depending on

the problem statement for the assignment. [Thagaard, 2006] I have not been interested in differences between genres, and have not takes sex into consideration. There may be a difference in how people approach the system based on the sex, but I have been more concentrated on how the test-persons have been able to make use of the system than differences in sex. Having that said, I think it is important to state that I had both men and women represented in the test-groups, and did not see any evident differences in how the made use of the system. (But I did not look for it either.)

In the matter of selecting the right amount of informants, Thagaard [2006] prompts that you should chose as many informants as necessary until the answers given to your questions gets repetitive. When you can see a pattern in the answers, how people or the answers given separate the answers into groups, you have a pattern and you have reached the right amount of informants.

The selection of informants to the interviews will be described here, while the selection of participants for the usability test will be described in chapter three, with the rest of the information concerning the usability test.

2.4.1 Interview

As I want to investigate how the designers build upon their frames while designing Ciscos teleconference system, I found it necessary to speak to them. The ones I will interview are all a part of the interactiondesign team at Cisco. The team consist of eight people, and all of them have worked with designing the front end for Ocean and T3. My supervisor, who is also the manager of the UX and interaction design team, gave me names of who to contact. I sent them a email with an invitation to a interview. In the mail I explained what I am writing about, who gave me their name, and underlined that they would be kept anonymous in the assignment. Five out of seven accepted and responded immediately, within the afternoon the same day. Those who didn't respond quickly, haven't responded at all. Four of those who responded immediately know me from before, when I worked at the company through the summer of 2010, in their team. I did not work close with them, but two of them attended the meeting where I presented my findings from the usability tests, and the same two helped me organize the technical aspects for the usability tests for the assignment. I interviewed two of them for another task that I did for the team. The last respondent was on vacation most of the time I worked at Cisco, and I have never met him. The fact that I have met almost all of them before may be an ethical dilemma, as they may look upon me as a colleague more than a scientist doing research. On the other side, this can be beneficial, as they may speak more freely to a colleague than a strange scientist. This can of course turn

the other way around, as they don't want a colleague to know about intern argues and shifts in the team. Because they know me they may not go that much into detail in every story they tell, assuming that I understand what's behind and what that has happened and why it happened. This is a challenge for me as a scientist, and I need to keep it in mind when constructing the interview guide.

The fact that it is their supervisor that game me their names may affect the results of my study. We have not spoken about why it was those people he chose, the only guideline I sat for my interview objects was that they had to be involved in the design process. The fact that his name was mentioned in the mail, may have affected the persons in how fast they responded, but considering the fact that most of them know me, I believe that is a grater factor.

Chapter 3

The Usability Test

> *Usability testing refers to a process that employs people as testing participants who are representative of the target audience to evaluate the degree to which a product meets specific usability criteria.*
>
> [Rubin and Chrisnell, 2008, p.21].

The usability test was chosen as a method in order to study how a group of people interacted with T3 and Ocean, if they were able to make use of the technology presented, and what they used in order to construct meaning. It was a method to expose the users' expectations of the systems, and test how it correlated with the designers' intention for the systems. Testing T3 and Ocean was also a way of looking at the result of how the designers work, and as both of the systems are under production, I got to see how the work evolved between each usability test.

Rubin and Chrisnell (2008) has conducted a list of basic elements when running usability tests:

Research question Develop your research question or test objectives, rather than hypotheses.

Choose your users Select a group of representative end users. Based on what you want to test, decide whether the test would gain from a random selection of people, or chosen.

Set up location for the test The test should be run in its natural environment

Observation of end users who either use or review a representation of the product

Interview the participants during the test, and sometimes after the test to get complementary information from the user.

Analyze Collect all qualitative and quantitative information about performance and preferences. Analyze it and sort out the most relevant information.

Recommendation Based on the findings from the test, redesign and/ or make recommendations for the design of the product.

Rubin and Chrisnell [2008]

There are others who have created lists of how a usability test should be conducted. User experience specialist Haakon Halvorsen presented at a Usability seminar in November 2010 a list of elements to remember when conducting a usability test. Most of his points were the same as Rubin and Chrisnell's, but he also added "prepare assignments" and "conduct a pilot test", as well as editing the video under the section of analysis. [Halvorsen, 2010] As the findings were to be presented to the designers, the importance of video editing became evident. The designers needed tangible evidence about how a situation had occurred, and video clips had a larger impact than words: it was not seen as valid until they could see it for themselves. Their attention was difficult to hold, they were not interested in the whole test, only the highlights. If it is difficult keeping the attention of those who work with the system that has been tested, one can only imagine how that would when presented to a client, unknown to the field. Clipping and making the tabloid film turned out to be not only the best way to present the findings, but also as a good analytic tool. Editing the films, and searching for highlights and comparison among the testers, took time, which allowed me to spend more time with the material, and analyze it several times.

The test had two different aims. The first was on Cisco's behalf to test the usability of the systems, focusing on basic skills such as "are they able to perform the tasks given?", and secondly to test consistency within and between Ocean and T3. The other aim of the test was for this assignment, where the focus were to learn more about how and why the test-persons succeeded or failed when testing the systems. Learnability was also a goal, and through examining learnability it exposed the testers reasoning and decision-making processes, and whether they correlated with the designers' intentions.

They were given a form to fill out after the test, where I wanted them to speak about their experience with the system and what they related it to. This was in order to find out more about their expectations but also their frames.

The persons were selected based on their background, age and availability. It was important to find people who could imagine a need for the use of a video conference system in the future. As the system is mostly sold to knowledge intensive firms, I chose users with a university education, either recently finished a bachelor or master degree. They were all between 25 and 30 years old. The reason that I chose this *age-segment* was mainly because people who have recently finished either university degrees are in this age category, and are thereby fairly representative for the group. I tried to recruit people who came from different departments at different universities, but it was difficult. Most of the persons who agreed to participate had some sort of technical background, either as engineers or informatics. One of the participant was a medicine student, and one an economist. Those who did not have a technical background were a lot more difficult to recruit than the others, and needed a more reassurance and information about the test. Some agreed, and didn't make it after all, but some said no, afraid of testing an unknown device. This probably affected the results of the test, as most of the test persons were "super-users" of technology, and not afraid to try something out. In this matter, they may not be that representative for the group defined as highly-educated persons, but rather more representative among high-educated persons with a fairly mathematical background. If I had more time and resources, it would be very interesting to get hold of people with a wider background, in order to test if they share frames with my test group.

As for the third point of choosing location for the test, I used a lab, one for each test, provided by Cisco. This was not an optimal place for the test according to Rubin and Chrisnell [2008], but as the systems tested are out of the natural working and living environment of most of the testers, and due to the fact that T3 is a stationary system, a lab was the only way to conduct a test. After the test, the testers were asked to fill out a form to summarize their experience.

There are different methods to use when observing the testers. Some researchers use high tech equipment such as eye-tracking which monitors where a user focuses on a screen, or heat map tracking, that display where the user has clicked with the mouse most times. These methods may be both cost and time consuming because not only is the equipment expensive, but it also generates a lot of data, which takes a lot of time to sort and analyze afterwards. The equipment may give more accurate answers, but a lot of the answers can be found through observing. I kept to the "old fashion" way of conducting a usability test, using a video camera for documenting. The benefits and disadvantages of this is discussed in chapter two.

In advance of the test there was a pilot test. The test worked mostly as

a check that all equipment was in place, and served as a good preparation for me as a *test-moderator*.

3.0.2 Method chosen for the usability test

When conducting a usability test, there are several techniques to use; Focus groups, scenarios, co-discovery, incident diaries and feature checklist or work-shop. Which one is the most suitable depends on at what stage in the design process you want to conduct a usability test.

I chose to use scenario as a method for how the test would be conducted. The aim of the test was to investigate the functionality of certain elements in the interface. A focus group would depend on testing the system in advance of the test, and therefore ruled it-self out, due to time constraints. A co-discovery could have been appropriate, but as I wanted to keep my focus to one tester at the time, and be a greater part of the conversation about the interface, this method was ruled out. Incident diaries were impossible to arrange, as T3 is stationary, and at the time of the test the systems, was not a part of any of the testers daily work life. A workshop ruled it-self out through the same reason as a focus group, but both would have been good either if it was at an earlier stage at the design process, or as a tool for further development after a test.

I chose scenarios. One of the reasons for choosing scenario was that it was a goal to keep the test rather structured, due to the fact that I wanted feedback on certain elements with the interface, and also to keep the tests consistent. The same assignments were given for both T3 and Ocean, due to a part goal of testing the consistency between the two interfaces, but also if the tester made use of the interface in different ways between the systems. T3 has a larger interface than Ocean, and I was interested in testing if it had any impact of the use. Another goal was to investigate whether they would apply different methods between the interfaces, eg. what they would do when they wanted to zoom, or other possible situations. The scenario was simple, with few tasks. It was an intentional choice, due to several reasons. The first was that none of the testers had seen the interface before, which I assumed would affect the time spent at the test. In order to keep the testers attention throughout the test, it was important to limit the amount of time consumed at the test. Toftøy-Andersen and Wold [2011] recommend approximately fortyfive minutes per test, but that includes the minutes spent in advance of the test preparing each participant with information, the preset questions and coffee, and is not strictly the test it self. It was also important to have enough time at each task, in order to be able to conduct an unstructured interview on the run throughout the test. The interview functioned more as a conversation where the aim was to learn more of the testers thoughts about

the system's functionality through the test. Another reason for making the scenario rather simple was to avoid the level of influence from the scenario to the test-persons. I wanted them to perform the given tasks and let the focus be on the interface, and not be too controlled or inhibited by surrounding information about the scenario. The scenario is built up as a project meeting at the university, where the participants are to set up a conference with a co-student, and then phone two co-students at the same time, for then to add a presentation, and show it to the other students. All of the test persons have been or are students, and I thought a familiar situation could help them keep the focus at the interface instead of the assignment. It was also chosen because it would be a more familiar situation, intended to create a more natural setting for the test-persons.

The scenario is set up after J.M. Carrolls receipt from the article "Five reasons for scenario based design (2000)". Carroll states that a scenario should contain a setting and actors, who should have a goal and a plot. In this case, the setting is a status meeting at the University, where the actors goal was to fulfill the meeting, using video-conference. The rest of the co students were represented by sketches at the places of those the participants rang. This was due to the fact that it was difficult to get hold of actual people, but also because one of the other interaction designers at Cisco told me that she had conducted a successful usability test, using sketches of faces. During my tests I saw that the slightly embarrassed sketches made people laugh a bit, and more relaxed. When it wasn't a real person facing them, they made jokes to the sketches, while if we at some point met real people they were very serious and were most keen on getting done with the test as soon as possible. With the sketches, they dared to test different options, play with the interface, eg. press buttons they wondered what would give them.

3.1 The tasks given at the usability test

The usability test was set up as two separate tests, but with the same tasks at each tests, due to consistency. The tasks were chosen because of their significance as they are assumed to be the ones most frequently used at a daily basis of both systems.

The names of both testers and designers are fictitious. Through the text, there will be quite a few persons referred to, and I see it as appropriate to give a list of who is from the test group, and who is from the design group.

TEST PERSONS	DESIGNERS
Martin	Jens
Magnus	Kristin
Astrid	Henning
Hedda	Hans
Emil	Ida
Marie	Anders
Siri	
Christian	

Figure 3.1: Names

Task one

We are about to conduct a status meeting for a project at the university. The participants at the project are spread over different locations, and we are thereforee using this video-conference system to gather all of the group members.

1. Make yourself comfortable
2. Find Firstname Lastname1 in your favorite list, call to hear about his progress with the assignment
3. End the conversation with Firstname Lastname1.

Task two

It is about time to include more of the group-members.

1. Find Firstname Lastname1 and Firstname Lastname2.
2. Phone them at the same time.
3. Look into *History* and find the last group-member Firstname Lastname3. At T3, there is no history, and the testers were to use the search area.
4. Call her.

Task three

When Firstname Lastname3 is included in the conference, it is about time to show the other group-members your presentation. You can find it at the computer next to you.

1. Connect the computer to T3/Ocean. (Use the vga cable)
2. View the presentation with the other participants at the conference
3. End the presentation
4. End the conference.

3.1.1 About the tasks at the test

The test was set up to start with the simplest task, and then advance to a more difficult level. I let them spend as much time as needed at each task, hopefully to see and hear their interpretations throughout the test. Having said that, the time spent at each task determined whether a task was seen as a success or not. This is due to the efficiency goal of the usability. Effectiveness and learnability, was baked into this understanding. I also saw natural mapping as a segment of learnability, where natural mapping had an impact on whether the testers were able to learn and make use of the system. The aspect of Accessibility not a relevant factor for this test, as every needed tool (such as the vga cable) was in the lab in advance, and other tools needed in the interface was their hands to touch the wanted places. I did not have any focus on whether the system supported disabled people, such as blind or impaired. During the test and after the test, I spoke with each participants, interested in whether they saw the interfaces as simple and to what extent they were satisfied with the interfaces.

Most of the participants tested Ocean first and then T3, but Sebastian and Marie switched, and tested T3 before Ocean. I saw little or no significant differences with the outcome of the test depending on which interface they started the test with. Of course there was some variance, but as far as I could see, these were individually centered, concerning how they used knowledge gained at the other interface to create understanding in the new interface.

3.2 Task one

At task one, they were to find a given person in the contact list, and set up a conference with that person. They could chose to start the conference

through the context card or the global menu.(see fig.3.2 and 3.3) This test was to assess the basic functionality of the interface, and also to see if they understood or took use of the paradigm of the two search fields "history" and "Phone Book" and to check how they took the search field in use, if they used it.

"It was as easy as it could be"

Martin about task one.

All the participants managed task one at both systems. None of them used the Phone Book at T3 in this task. The search area was only used by Sebastian at this task. Findings about the search area is gathered from all of the tasks, and placed under its own section, see section 3.2.2.

"What's logic is to click on contacts..."

Magnus talking about the first task at T3.

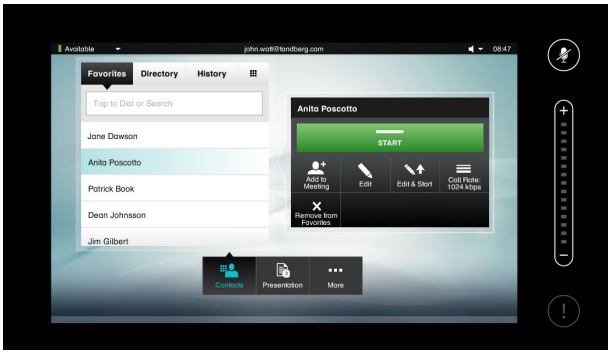


Figure 3.2: Dial favorite using context card

"Stupid question, but can you use mail when you are phoning? I have never seen it before. "

Astrid

The arrows at Ocean beside each contact confused some of the contestants, as they got more options than expected. It became evident that most of the contestants did not discover that the name of the contact appeared at the participant bar (The participant bar is visible at the bottom line with a lightning sign saying Patrick Book in 3.3) when they tapped at the

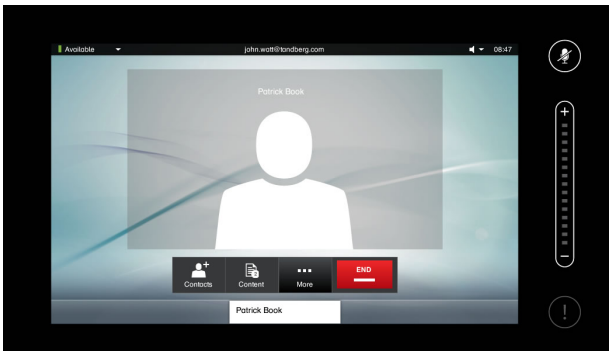


Figure 3.3: In call

name of the contact in the contact list. When this finding was presented the designers, a change was made, and the arrows were removed. The context card now appear as a default when a contacts name is pressed. When nothing happened, in the eyes of the testers, they pressed at the arrows to find the functionality they were looking for. Marie, Siri, Magnus and Martin did this, and started the conference through the start button in the context card. Hedda and Emil chose to go through the "add to meeting" button in the context card, and then used start form the global menu to set up the conference. What most testers perceived as nothing happened after they pressed the name of a contact, was a lack of feedback and visibility. What actually happened, was that they pressed a name, and it appeared at the participant bar at the bottom of the interface. What I found was that most testers had their hands above the participant bar, or their focus was still on the contact list, so they did not perceive the action at the participant bar. When this finding was presented the designers, they added a feature which afforded feedback. The selected name has been given a shade of blue, as you can see at **??**. It was only Sebastian who used the participant bar in this session. This may be because he tested T3 first, where the participant bar is larger, and more visual than at Ocean. Sebastian never used context card at any of the sessions at Ocean, and he had a clear awareness of the participant bar's existence. I will talk more of confusion about the context card in the next session.

3.3 Task two

The second task was to connect two people at the same time. It is possible to connect one at the time through the context card, and later add the next participant, but the test was to see if the testers were able to understand that it is possible to start a conference with several participants at the same

time, and that they had to use the global menu to do this.

> "It was a bit difficult to understand how to start a conference with several participants."
>
> Siri

> "If I click here, I assume I will get more options."
>
> Emil

Emil chose to use the context card, thinking that it would present him a solution of how to add two persons at the same time. Sebastian, on the other hand, who had tested T3 before Ocean, was aware of the participant bar at the bottom of the interface, and thought differently.

> "I can phone when they are down there (participant bar)."
>
> Sebastian

He tapped at the names in the contact list, and saw that their names appeared in the participant bar, and imagined that it signalized that he could start the conference with all participants at once. He used the start button in the global menu, and managed this task with no difficulties. When Hedda did this task at T3, she searched for a place where she could invite both participants at the same time, and looked for it in the context card that appeared when she pressed their names at the participant bar. She could not find any solution, and the task failed in T3. While in Ocean, she had learned the functions and managed to do it right. Magnus picked each contacts and added them to the participant bar through the context card, and then started the conference through the start button at the global menu. The task failed for the rest of the testers, as they had to be told how to start the conference with several participants at once.

At T3 there is no arrows, the participants show up in the p.bar when you press their name. Several of them note this, and Magnus summarize the general thought of it:

> "Because there is no arrows (at T3), the interface become easier."
>
> Magnus

This finding has two results; one can look at the system's lack of simplicity, stating that there were too many options for sorting this task, and that the options did not afford its purpose clear enough, or that the systems were not consistent enough. The last one was followed, as the finding was presented the designers, they made a change in the interface. The arrows were removed, and when a contact's name is tapped now, a context card appears. This was done before the senior group were to test. All of them used the context card to set up a conference. When the interface works like this, *start* in the global menu has little functionality.

3.4 Task three

The third task was to see if the testers were able to connect a person that was not pre-set in the contact list to the conference and connect a presentation. The task of adding a person that was not pre-set was not very interesting for the usability purpose, but it functioned as an insight to the testers mind, and was a good method for discovering other elements of the test, which will be presented under the sections of keyboard, feedback, search area and interface.

Connecting a presentation had many different aims. I wanted to investigate how the term was perceived, if they understood that they had to connect the computer physically, and what they expected to occur when they pressed the connect-, present- and end presentation- button. I was curious about whether they easily understood that they had to use the button on the outside of the interface at T3 in order to end the presentation. None of the testers had any trouble with understanding that they physically had to connect the computer to T3 or Ocean with a vga cable. Hedda addressed a desire for the system, where she wanted to have the computer connected wireless. She did not see any need for Ocean's presentation mode unless she could have her computer located elsewhere, and navigate the presentation through Ocean. Martin, Magnus and Astrid were able to use *content* as a place for presentation at their first try. All of the other testers tried to find presentation through more, both in Ocean and T3. I am not sure if they understood content as a metaphor, or if it was due to the fact that most of them had tested *content* in advance, searching for something else in a previous task. It was obvious that many of them used the image of a computer to understand that *content* was related to the computer they just added, as several of them had comments about it:

> "Nice icons, they are more informative than the text"
>
> Magnus

> "If it wasn't for the laptop icon, one would not understand that it is a place for presentation."
>
> Emil

> " I want to press on more, but on that button there's a computer."
>
> Hedda

Even though Hedda saw the computer icon at the content button, and understood that it could have something to do with her computer, she preferred *more* as a more likely place to find presentation. It did not take her much time before she understood that it was wrong, and chose content.

Moving on to T3, and Sebastian and Marie who tested T3 before Ocean. Sebastian did as most of the other testers, and tried more before content. Marie on the other hand, tested content first. She was the only one through the whole test who did this, without being there in advance. Martin, Magnus, Astrid, Emil and Siri were all able to present their content efficient at T3. Martin explained it with consistency, while Emil, Astrid, Hedda, and Siri were a bit uncertain about the mode, due to the change of icons. This may indicate that they did not perceive the reason for the name content, and that it was only the icon that had given them a hint of where to find the function they were searching for. Emil's comment gives a hint about that he knows that he will achieve his goal through using content, but that he does not understand the logic of content as a placeholder for presentation.

> "I'm betting it (the presentation) is on content... Because it was the same placement as previous, but now there isn't an image of a computer..."
>
> Emil

When the testers were to exit presentation mode at Ocean, they had troubles understanding that the presentation was ended, and which mode they were in. Ocean went directly into local presentation mode, which means that the tester is the only one to see the presentation. As this happened automatically when they pressed *end-presentation*, many of them were confused when they themselves pressed local view, which resulted in a interface of the *local view*. Local view was taken out of the interface shortly after this test, and replaced with other functions the designers saw as more valuable. Ending a presentation at T3, exposed a lack of consistency between the two interfaces, and a lack of consistency and natural mapping within the T3 interface. All of the testers had troubles with this task, they tapped within what

they saw as within the borders of the interface, and exposed many gestures. These will be elaborated further in their own sections, interface and gestures.

Task three of the test was a failure. It was not efficient, nor was it effective, as all of the testers used a significant amount of time on it, and it did not behave the way the users assumed it to. The level of consistency was low between the two interfaces, and within the interfaces on its own. At Ocean, it was not consistent with the system entering local presentation mode. None of the other features at the system occurred without users involvement. At T3 it was inconsistent because it was the only place where the user had to go outside the material borders to end the presentation. This

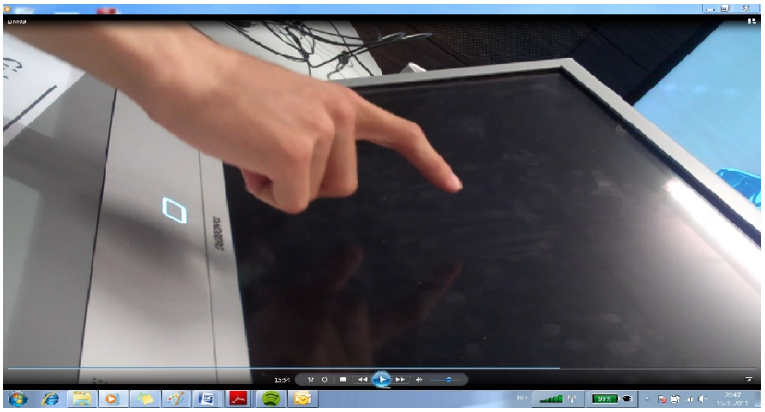


Figure 3.4: Magnus tries to end full screen presentation mode, not aware of the lightening function at the bottom of the interface

can also be seen as poor natural mapping. Looking beyond the fact that the test was a failure, it served as an eye-opener, as it exposed a lot of unforeseen actions, and a good way of discovering different methods for reasoning and decision-making, not at least an insight in the testers inhabitant gestures. I also found that as the test-persons ran into new troubles, they gave me a rich insight into their technological frames, and advocated my interpretation of looking at technological frames for a deeper understanding of the testers expectations and reasons for the choices they made.

3.4.1 Keyboard

The keyboard is an example of the usability of entrance only when needed. When using the search area, the keyboard popped up, and covered the global menu. The size of it was big, filling half of the screen. It disappeared when you pressed *start/add*, or tapped on the surrounding interface. This feature with the keyboard harmonizes with Holter [2010]'s interpretation of good usability for touch devices. The keyboard was known to all of the testers,

which made it simple to use, and allowed the testers to keep their focus on the goal of their task, and be effective. It was only Hedda who did not use the keyboard at all at Ocean. At T3 they all used it, Hedda included. The keyboard looked more or less like an actual computer keyboard, the characters of the alphabet were placed at the same spots as a computer keyboard, which indicate good natural mapping and score on the usability principles of being efficient, effective, satisfactional and simple to use.

3.4.2 Search area

The search area was frequently used by all of the participants. At Ocean, it was only Hedda who did not use it, but she took advantage of it at T3. Martin was irritated that the search area was not cleaned after use, so he had to erase the name of the last letters typed. The search area exposed that all of the testers expected the system to come up with proposals to persons as they entered letters, and that most of the testers stopped after entering three letters, expecting the right name to appear. When this did not happen, they believed something was wrong with the system. Astrid was the only person to search by surname, and was confused when the names were sorted by firstnames. This was changed when the designers were presented the finding, and today it is possible to search by both first and lastname.

3.4.3 Feedback

Throughout the tests, the lack of feedback appeared as a strong and deficient element for the novice users. Astrid, Hedda, Sebastian and Marie all addressed the lack of feedback when a conference was started. The fact that there were mock-ups and no real persons in the other end of the conference, can give an answer to why the participants felt a lack of feedback, as they did not get any other feedback than the image of the mock-ups. On the other hand, it may also be an indicator of a lack of feedback, a fault made by the designers. As they have tested, they may have seen the contact established as an indicator of task accomplished, and thereby neglected any other feedback about what is happening. Either way, the representation of where people should be seated was present, and it should be seen as an indicator for the need of more feedback such as text or similar to when a conference is started and who sees what when the conference has begun.

> "Silly question, he saw me now, right?"
>
> Astrid

Hedda asked the same question. Sebastian talked to his mock-ups in order to get feedback.

"It should have been a picture of me, like when chatting through webcam."

Astrid

"I don't know if the others can see this. Kristian, can you see it?"

Sebastian misses feedback

I don't have any representation of what the others are looking at. Am I dependent on oral feedback?"

Marie misses a way to see what the other contestants at the conference as looking at.

The desire for feedback was in contrast to the designers vision of the system, as they were eager to create a natural setting, and make the video-conference as natural as a live co-located meeting, where there were no self-view, and all feedback occurred through oral communication. To have a representation of one self can be perceived as disturbing, when focusing at the present meeting, but due to the fact that people are not co-located, it is valid to state that there is a lack of feedback of knowing what the other participants at the conference is seeing of the content you are presenting.

3.4.4 Interface

The interface was differently perceived among the test-persons. In all groups, most of the participants struggled with finding a button on the outside of the lighting touch interface. The old group had troubles with the mute-button, the young and the experienced group had troubles with the end presentation mode at T3. It was only Sebastian and Hedda who showed any interest in what was on the outside of the lightening interface, as they believed the "missed call" button at the bottom right were some sort of a "wakening" button for the system. (see fig 3.4 for illustration.) The result of this emphasizes a discussion of whether the situating of buttons, or the use of color/contrast effect should be taken in consideration.

3.4.5 Affordance

Because of the setting and intended use of the T3 system, there was a general belief that the system should be easy to use, and without any manuals. The designers have (almost) succeeded in terms of Norman's requirement of affordance. One of the goals from the usability test were if the users automatically understood how to operate the system. I will state that the system

afforded what it aimed at in most cases, except for the case of ending a presentation at T3. There were few instances where the testers did not perceive what was intended to by each icon. The testers had problems with starting and ending a presentation, but the troubles with starting a presentation was due to the label of the function rather than its affordance. The troubles the users faced were not due to affordance, but the perception of the border of the interface and the labels given.

3.4.6 Accessibility

Accessibility was not given much attention at the usability test. The reason for this was that it was not a principle that I had in mind when I created the test, but an aspect I thought of later. None of the testers had any disabilities, and it was therefore not an issue when testing. Having that said, I noticed when going through my material that the interface has not been designed for people with disabilities. One might argue that it is not a tool with much purpose for blind people as most of the point is visual contact, but as there are many levels of disabilities such as poor sight or people with low functionalities in their hands, Accessibility is worth looking at. The only tools available when dealing with the Ocean and T3, are your own mind and two hands. At both Ocean and T3, the global menu is large enough for most users, and none of the test-persons had problems with it. The buttons are large enough to be tapped at, and their size indicate that they should be visible. The borders of the global menu are black at Ocean, and it is therefore plausible to state that it is not in conflict with contrast issues. When a tester pressed a button at the interface, it turned to light blue. This was not something any of the testers noticed, and it is possible to state that the feedback after called action scored low on visibility. Another aspect of it, which legitimates the low score on visible feedback after pressed button, is that the focus of attention of the user was moved to where it was relevant to look, either if it was to look at the contact list or the menu presented at more or content. In the contactlist at T3, it is possible to search the phone book by clicking at a character in the alphabet. The first testers, Astrid, Martin and Magnus had difficulties hitting the right characters, as they were so small that they kept pressing the wrong place. As this was discovered, it was fixed before the last test-persons conducted the test.

Hedda stressed at presentation mode in T3 that the size of the presentation when it was not presented in fullscreen was too small for her father to see, and she tried to zoom at the interface. As T3 is much bigger than the interface at Ocean, it is valid to state that the trouble is likely to occur at Ocean as well as T3. When thinking of people with poor sight, it can be valid to argue that there is a lack of accessible tools for zooming in on the whole interface of both systems, as some might have troubles seeing some

of the elements in the interface, such as the contacts in the contactlist, or the characters on the keyboard, or the menu in *more*. The interface has no audio feedback. I will argue that audio feedback in a conference will be more disturbing than helpful, while feedback through the texture at the interface would be more effective. Perhaps it is difficult to arrange practically, but it is an element worth considering.

3.5 Gestures

I was not aware of the impact of gestures in advance of the test, but throughout the test, it became evident to me that this had an impact on the level of success at the task. The testers were confused when they tried out gestures that did not work as predicted. Most of them tried to do the same thing once more, before they gave in and tried another option, which was often another gesture. They learned on the go, and when they tried to use a gesture that they had learned and that worked on a previous session, they were confused when it did not function, or other functionalities were possible than the ones they had learned, at another task in the test. The gestures used were also a way of discovering peoples frames, from other touch-interfaces. It did not only reveal that people had frames, but also how they were able to get lost in their own frames, or unable to reframe.

Eikenes [2010] wrote his phd about 'kinectic interface', a concept for analyzing screen-based digital artifacts that are characterized by visual movement. He used the term *navimation* for describing the use of gestures used when navigating in an interface with movement. Eiknes argues that kinetic interface plays multiple roles in modern culture and use, an argue I would agree with after seeing how great an impact it had on the testers' level of success. His argument is that "interfaces are meaningful and cultural artifacts that employ signs or semiotic resources to communicate through their design in use. At the same time they enable activities to be carried out through instrumental mediation, much like tools or instruments." Eikenes [2010].

Most of the test-persons were accustomed to touch interfaces from eg. smart-phones, cameras, vending machine etc. I will assume that this is where they have achieved their knowledge from. Sebastian was the only one to take advantage of the drag' n drop method available for switching between the elements, while the others tapped on the wanted functionality, document camera or presentation mode. They were stressed when the elements moved around.

> "What's happening? Why do they move?"
>
> Marie

Marie shared this frustration with Emil, Siri and Astrid, who did not see the same drag n' drop method as Sebastian did. Holter [2010] underlined in his article of usability on touch interfaces that one should avoid creating things that are too fancy, it is best to stick to what people know, and that pressing a button is the simplest form of interaction. "Use it unless there is a good reason for choosing something else. Slide-functions and other gestures may look fancy from the designers perspective, but the user may not be too enthusiastic." Holter [2010] .Martin and Magnus did not pay that much attention to this, as they had seen the document camera vs presentation mode before, and was aware of their functions before the test began.

Moving further, from usability to technological frames

I have now spoken about my findings within usability. I believe that usability is a good way of discovering what happens, which methods function, and which methods that don't function. Throughout the test, I had an aim about learning more of the reasons the testers had for choosing an approach for solving a method, and I have found usability inadequate for the purpose. The usability methods have given me a rich insight into the testers mind, but has not been able to answer questions such as why did Astrid have a vision of searching for last names rather than firstnames, or why didn't the testers grasp the concept of content? Another question that has been brought to my mind is why did the designers perceive it as a clever idea to place functionalities on what the testers saw as the outside of the interface? This leads to a new question of how did the interface end up in that particular way?

As all usability principles applied on this test can be interpreted in many different ways, depending on the eyes of the researcher, the answer can be found in the mind of the designer and tester. In an effort of answering the questions mentioned above, it is valid to turn to psychology. Through knowing more about why a person chooses this or that method to make use of a system, I believe we can learn more about their expectations, and thereby make better design solutions in the future. This test has revealed that expectations are brought into usability only as a segment of separating good design solutions from the poor ones, and to visualize what the user comprehends or not. Any revelation that does not fit with one of the principles is therefore left out. But it does not mean that they are not interesting, or that they have an impact of the use of the system. Through knowing more of where a user has his expectation from, one can use it as an inspiration for further research as development. As stated in the introduction, I have chosen Orlikowski and Gash concept of Technological Frames to examine the mental processes that happen when facing a new technical artifact.

Chapter 4

Technological frames

> "Technological frames is how people understand technology, and what they use in order to gather the understanding."
>
> [Orlikowski and Gash, 1994]

> "The sense-making device that an individual uses in relation to technology is termed a technological frame."
>
> [Lin, 2005]

4.1 Technological frames as an analytic tool

The study of Orlikowski and Gash that created the term "technological frames" was based on a study of the implementation process of Notes at Alpha Corporations (a fictitious name). Orlikowski and Gash found three domains to characterize how the users gained understanding for Notes, the system they were to learn. The first was *the nature of technology*, the second was *technology strategy*, and the third was *technology in use*. The first refers to the way people understand technology, its functionality and capabilities. The technology strategy refers to «peoples views of why their organization acquired and implemented the technology.»[Orlikowski and Gash, 1994, p.183] This part includes and understanding of the organizations motivation and visions behind the reasoning for implementing the new system. The third, technology in use, refers to how a person vision the technology being used at an everyday basis. (ibid: 183) Their study found that the technologist and the users had different set of frames on all three domains. This became an issue, as they expected differently not only from the system, but from each other as well. Where the technologist and management believed that they should let the users play with the tool and learn it for them self, the

employees felt that there was a lack of instruction and training. One of the technologist made fun of one of the employees attempt at using his preset frames in order to understand the nature of the technology, and the use of a mouse. The employee had never used a mouse before, and tried to use it as a remote control, pointing at the screen in order to make it work. The technologist who were aware of how the mouse should be used were rather amused by it, which is a good example of how two individuals can have different frames when approaching a new device.

When I conducted the tests, I kept part two and three of Orlikowski and Gash's analytic tools and organizational aspects out of my scope, as I had invited participants that I expected to have a preset understanding of the usefulness of the system, and set a requirement that they could imagine taking use of the system in a future work situation. I was not interested in the organizational aspects as I have used the technology as a representation of the designers frames, and investigated which frames the user-group and designers share. The test was conducted in a lab, which give an unnatural setting, and then again not valid for investigating any organizational aspects.

4.2 Frames

The concept of frames in IS.research emerged in the 1970's. The background for the concept was a repeating lack of mutual understanding between system users and system analysts. Boland (1978) argued that the lack of understanding was due to lack of shared frames. Within his understanding of a frame was the set of understanding, assumptions and expectations that individuals have about new information systems, and which was used by individuals to facilitate and articulate their requirements for the new system. Boland [1978] in [Lin, 2005, 50] Orlikowski and Gash has embedded this definition into the concept of technological frames, and included knowledge as an attribute when they "...propose a systematic approach for examining the underlying assumptions, expectations, and knowledge that people have about technology." [Orlikowski and Gash, 1994, p.174] They look upon frames as cognitive structures or mental models, and argue that "...technological frames offer an interesting and useful analytical perspective for explaining and anticipating actions and meanings that are not easily obtained with other theoretical lenses."[Orlikowski and Gash, 1994, p.174] They look upon the concept as a mash-up from other theoretical approaches such as psychology, HCI and sociology, and that no other theoretical concepts are able to cover the content of gathered information shared within the concept of technological frames.

This is a fairly wide definition. In order to grasp more of its content, and

also to see where one can find those underlying assumptions and expectations, I will look more into what a frame is, and what it contains.

> " A frame can be understood as a cognitive device that enables individuals to comprehend, understand, and explain the world around them. Individuals rely on frames to make sense of their world."
>
> [Lin, 2005]

> " Frames are interpretations from the world that affects how we act. They serve the function of being implicit guidelines when organizing and shaping peoples interpretations of events and organizational phenomena, and give these meanings."
>
> [Orlikowski and Gash, 1994, p.176].

> "A frame can be considered a convenient way to represent a set of predicates."
>
> [Friedenberg and Silverman, 2006, p.365]

I will let Minsky use his own words to explain frames:

> "Here is the essence of the theory: When one encounters a new situation (or makes a substantial change in one's view of the present problem) one selects from a memory structure called a Frame. This is a remembered framework to be adapted to fit reality by changing details as necessary. A frame is a data-structure for representing a stereotyped situation, like being in a certain kind of living room, or going to a child's birthday party. Attached to each frame are several kinds of information. Some of this information is about how to use the frame. Some is about what one can expect to happen next. Some is about what to do if these expectations are not confirmed."
>
> Minsky [2009].

What Minsky says is that we have some "actors" inside our head that starts a set of preset expectations of requirements to the given situation we enter. An example can be going to a birthday party. We have expectations

about guests, cake, balloons, what to wear and what kind of a party it will be. Bringing this over to technology, one will have some preset expectation here as well, based on previous knowledge and experience with similar technologies.

4.2.1 Inspiration sources of Ocean and T3

Based on the argue above, that we use our frames when entering a new situation, I wondered which frames had been taken in use when the design of T3 and Ocean was created. To learn more about this, I asked the designers questions about their inspiration sources. Hans revealed that the phone book was set up similarly to general phone book standards, and Hedda wrote at her summary after the UX-test that she thought the phone book looked a lot like the phone book at her iPhone. Both Hans and Henning stated that they got inspiration from thinking about the user, that they liked to vision who they were designing for, and what aim that particular user of the product would have.

As the section above reveal, the most frequent inspiration source was, and perhaps still is, Apple products, such as iPhone and iPod. Henning justified Apple as a great inspiration source because they;

> " There are some conventions in touch, some principles defined by Apple. They were the first who were able to create an interface that appealed. They were not the first on the market, but no others were able to take proper advantage of the touch technology, it was too similar to computer interaction. You know, click,click, click. The challenge with touch is that you take away, or you skip a card, moving from one screen shot to another one, where all functions or buttons are removed. Within touch technology, there is no boundaries, you can apply buttons wherever you prefer. ... I believe Apple was able to be keep the focus of the function, the aim of the task, and that they kept it to a minimum. In addition, they applied the media in a matter that created a gained understanding of its use, and how to operate it. That's the reason for the connection between Apple, Ocean and T3. Android is quite similar to iPhone, even though the have implemented several desktops and applications. At the bottom line, our model is quite similar, when you focus on identity."
>
> Henning

That Apple had an impact of the design, was confirmed by four of the test-persons summary in the section of what the interface looked alike. Sebas-

tian, Hedda, Magnus, and Astrid all thought it had similarities to iPhone. Other answers given to what the system looks alike was MSN Messenger (Emil and Marie) Skype (Marie), HTC/ Smartphone (Marie, Astrid, Sebastian), Gmail(Marie), Live Meeting(Emil and Siri). During the test, I saw several situations where the test-persons used their iPhone frame in order to make use of both Ocean and T3. Some of these are represented at section 4.6.1, about interface.

> "...I like to gather inspiration from something that at some level have similarities... But I prefer it not to be an equal object."
>
> Kristin

When speaking about inspiration, Kristin stresses that when designing, it is helpful to seek inspiration at similar solutions. Looking at this saying through the glasses of *technological frames*, her explanation of how she gather different inputs, is a way of constructing and sorting frames that can function as inspiration when she is to design. Her inspiration does not only function as established frames, but she also seek them when she is about to start a new project.

When we talked about the design of T3 Kristin revealed that she sought for inspiration at multi player computergames, TV studios and how channels such as CNN bring in second and thirdpart's to the studio through videoconference. She was amazed by how TV, as a fairly new media had been able to establish certain rules and conventions of how to be operated, how to behave at the screen, and which expectations it has set to its functionalities. This inspiration about bringing people to life, as if it was in a studio, can be found in specifically T3, and how the second and thirdpart is represented. The first person in the conferenceroom, while second and third part of a conference is displayed at large screens, similar to a TV. You are presented them face to face, and the at the touch interface, the number of participants is represented with small icons of persons, identical to those that are used as contact-icons.

At a TV studio, the reporter starts talking to the second part as soon as contact is established, there are no other feedback to let you know that contact is established than the image of the other person. This is no problem as long as the conversation flows and the reporter get oral feedback or through facial expressions. During the test of Ocean and T3 feedback was mentioned as a problem for the users. I talked of it in the section of usability, and we got the explanation of why it has been made that way now. Because the second- and thirdparts at the usability test were cardboard figures unable to speak for themselves, it became evident that T3 has a lack of feedback.

Both Sebastian, Magnus, Hedda, Emil and Astrid tried to talk to the figures in order to understand what they saw, if it was the same as them etc. When they were in fullscreen presentation mode, they were unable to see the other contestants, and since they could not hear them, the test-persons were insecure of whether the cardboard figures were still a part of the conference, and whether the they were able to see the same as they did. This element of the big presentation mode can be referenced to the same method as when we enter a reportage at the news, where the images of the event fills the whole screen, and we only hear the reporter talking about the event. In a conference, where all parts are to contribute, this one way information stream does not work. It is most probably not the intention either, but with no information of who's speaker's on, it is hard for the presenter (here, the test-persons) to know if the other participants is there, and if they see what the presenter want them to look at.

4.3 How frames reveal them self

Frames are revealed through language, visual images, metaphors, stories and how a person chose to solve a problem. Frames are flexible in structure and content, having variable dimensions that shift in salience and content by context and over time.[Orlikowski and Gash, 1994, p.176]. Orlikowski and Gash cite Gioia (1986) that describes frames as " more as webs of meanings than as linear ordered graphs."[Orlikowski and Gash, 1994, p.176]. Friedenberg and Silverman [2006] view frames as a "...place to store attributes or properties if the concept (eg. a slot for each attribute), and actions (i.e. procedures) that can be applied to the concept."[Friedenberg and Silverman, 2006, p.365]. Minsky [2009] has a similar perception of frames as Friedenberg and Silverman, as he look upon frames as a network of nodes and relations, divided into two subgroups. "The top levels of a frame are fixed, and represent things that are always true about a supposed situation. The lover levels have many terminal- slots that must be filled with specific instances or data. Each terminal can specify conditions its thesis must meet.(The assignments themselves are often usually smaller subframes)Simple conditions are specified by markers that might require a terminal thesis to be a person, an object of insufficient value, or a pointer to a subframe of a certain type. More complex conditions can specify relations among the things assigned to several terminals." Minsky [2009].

Grasping how this terminals work, it can be useful to look at the usability test as examples. I will start with how they revealed themselves through icons and how the test-persons used different "terminals" to make sense of the different icons.

4.3.1 Start and end

All of the buttons in the global menu uses images that relate to one or several frames a user possess. For the usability perspective and technological frames, it is relevant to state that the buttons serve a vital function for the system, it relies on that the users understand their purpose, and that they are "pressable" for the user.

In advance of the test, the start and end functions was not something I thought would have any interest to look at. But going through my material, these two functions seemed to stand out. Martin, Magnus, Astrid, Sebastian, Siri and Emil all ended the conference at T3 through the end button in the global menu at a significant speed. It looked as though they did not think before acting. When they were to end a conference, they chose the red button. Most of the time when they were given other tasks, they looked at the interface, and told me what they thought of before acting. As Martin were given instructions to end the presentation in Ocean, he mediately pressed the red end button, instead of the cyan colored *end presentation* button. He quickly understood what he had done wrong, and stated;

> "Ups, I was a bit too quick, pressing that red button. "
>
> Martin

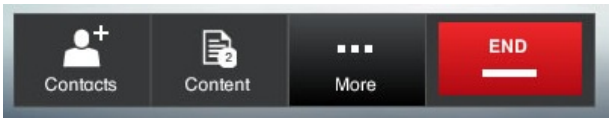


Figure 4.1: End call

I see this as a reflection of Martins frames. Martin chose the button "it had to be", instead of doing as he had done with all of the other segments of the test, where he looked at the interface at first, in order to make sure he chose the right button.

> "The fact that it says start make me uncertain, as I don't know what functionalities the system held, but I shall try it either way.
> "
>
> Sebastian

Sebastian was uncertain at his first test, because he was uncertain what function the start button held. He chose to press the button, due to the color. Jens justified that they could use start instead of call or similar words like this:

> " By using a big and green button makes it more obvious when you are about to make a call. It cannot be better visualized... I don't think it matters what the text says, as long as the button is big and green."
>
> Jens

I see *start* and *end* as strong frames in the western society. Matched with the colors green and red, their meanings are confirmed and amplified. For a person from the western society, or at least all of the participants from the usability test, the names invite to action and the result of your action is evident. The purpose is clear, and the words are known. The colors green and red inhabit strong conventions in our culture, where green signals go, enter, start,call etc, while red signals stop, end and similar actions. The color of the buttons signal possible action, and combined with the names on the buttons, the frame is amplified and confirmed. The colors at the button represent a shared frame from a culture that all of my test-persons was within, and thereby had little trouble understanding the result of what that would happen when they pressed the buttons. One can say that it is a technological frame within a large social group, the western culture.

4.3.2 Keyboard

As noted in the usability chapter, the keyboard function was a success, all of the participants were able to make use of it. By using a replica of a computer keyboard, the designers relate to the test-persons existing frame of how to operate a keyboard. There were some examples though: Sebastian got frustrated and did not understand much when the space button was replaced from its usual spot.This small change showed that a frame can be fragile, and that it didn't take much to challenge a frame. Emil exposed a frame as he was searching for a person with the letter Ø in her name. As he was typing her name and it was time to press Ø, he went straight to the O, tapped his finger on it for a few seconds, and an alternative of letters appeared. When he was asked later on why he did that, he explained that he did not have the character Ø at the keyboard at his smartphone, but had to go through O to get there.

4.3.3 Contact

One of the first things the test-persons did at the first task of the test, was to find persons under *contact*. None of the participants had trouble understanding that they were to look for a given person under *Contact*.(see figure of the global menu.)I take that as a sign of that the name contact and the symbol used are established conventions in our society. History was the default option at Ocean, and most of the contestants found the persons they were searching for under this category.

Figure 4.2: contact icon

4.3.4 Search area

As mentioned in the usability chapter, the search area was used by almost all of the participants from the young and the experienced group. Astrid was confused when she got no hits in her search. The reason was that she always started her search by surname, and not firstname, a function the system was not calibrated for. When I asked her why, she explained about a frame from all work related situations. She said that because this was a work related artifact, and because she understood that all contacts had been added in advance, they should be sorted by surnames, and not firstnames. Astrid reasoned this argument with that it could be many people by the name eg. Marit, but few that carried the name eg. Nordseth. She explained that it was different on her or others personal cellphone, as she felt it unnatural to search by lastname in her private phonebook. This was a frame that concerned differences in how to operate at personal vs public systems. None of the other participants shared this frame, they all started their search by firstname. When this finding was presented the designers, it was obvious that they shared the same frame as the other participants at the test, it was not something they had given a thought. Still, they understood that this situation probably would occur again, and made sure it was fixed.

Martin, Magnus, Sebastian, Marie, Hedda and Siri all started their search with the first letters at the contact name. As stated in the usability chapter, they all started the search by inserting a few letters, expecting a sorted list that would match their inserted letters. This was a frame they shared, adapted from Google's search area, Wikipedias search area, iPhone's search in contact list, and many other search fields that provide a sorted list of

suggestions that match the typed letters. What was interesting here, was that the participants were confused when nothing appeared. Some of them reacted by deleting all inserted text and start over again, thinking that the spelling was wrong, and some of them continued with a few more letters. Emil tested a few times with adding more letters, before he tested another frame, searching by surname.

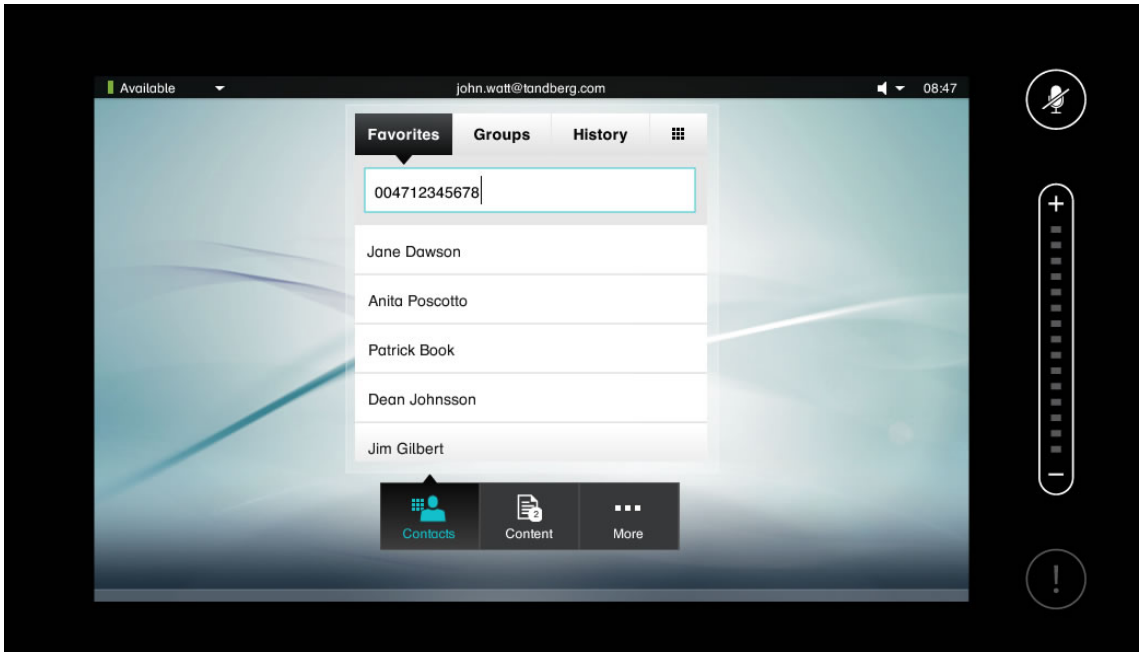


Figure 4.3: Ocean: Writing in the search area

4.4 Frames as context and time dependent

Orlikowski found that people's frames are both *time* and *context dependent*, and that they are «always more valid when examined in-situ rather than assumed ahead of time»[Orlikowski and Gash, 1994, p.184] Orlikowski and Gash had in advance of the study a set of categories from the literature. Out of seven preset categories, they discovered only two of them in their data, and concluded that frames are context and time dependent. Orlikowski and Gash further argue that that one person, using the same technology as used previously, will in an other context make use of a system in another way, because the setting partly defines the situation.

As the usability test was conducted in a lab, I did not look at the context

of the test. The lab does not represent a familiar setting to the test-persons, and therefore makes it difficult for me to evaluate how it would have been in a natural setting. I have therefore kept this segment out of my analysis. The designers on the other hand, have had the design and creation of Ocean and T3 as their every day work practice, and it is therefore likely to state that the context has affected their work. I have chosen to look upon the products as a representation of the frames the designers share, (or at least design-decisions they have agreed upon), and kept my focus at the frames that are exposed in the design, and the frames that both the designers and the test-persons share. I have decided to keep the sociological perspective of how the context has affected the work process, out of this analysis. The section "technological frames within a social group" reflects some of the designers decisions, as well as the section of inspiration above. The fact that I have chosen to keep the sociological perspective out of this analysis is probably an interesting issue for further research.

4.5 Technological frames within social groups

«In this literature, technological frames are the understanding that members of a social group come to have of a particular technological artifacts, and they include not only knowledge about a particular technology, but also local understanding of specific uses in a given setting.»[Orlikowski and Gash, 1994, p.178].

Frames are individually held, but some frames with significant overlap of cognitive categories and elements, are assumed to be held by many individuals. [Orlikowski and Gash, 1994, p.178] The frames create a social understanding, that affects people to engage in symbolic actions, that includes particular rules, rituals and customary practices. [Orlikowski and Gash, 1994, p.178] The shared frames also create a social phenomena, that supports a mutual understanding of what «acting as normal» in the society includes. It is also an analytical tool for understanding why people take certain arrangements for granted, which arrangements we take for granted, and why we organize our everyday life or society the way that we do. It is difficult to grasp what's underneath ones actions, and as a tool for the analytical process, Orlikowski and Gash proposed following questions: «What frames do particular groups of individuals share, why and with what consequences? How are these shared understandings formed, reinforced institutionalized, and change over time. What is the underlying process of such cognitive formation, stagnation and modification? [Orlikowski and Gash, 1994, p.199]

As Orlikowski and Gash were interested in learning about the organizational scope, the last questions was interesting and of value for them. In

this study on the other hand, the organizational perspective is left out. I have therefore cut that part, but kept asking the questions of "Which frames do particular groups share, why and what are the consequences". The last part of Orlikowski and Gash's questions concerning social groups; "How do shared frames of a group become embedded in technology design and work routines, and with what consequences?"[Orlikowski and Gash, 1994, p.199] In order to find examples of how frames have been institutionalized in the design group, I have asked questions about their background, hoping that it could reveal some "basic" frames.

3 out of 5 had their education from the same University, NTNU (Norwegian University of Science and Technology), but with some differences. Two of them within industrial design, the same as their boss, and one with technical design. The last two had their education from other schools, both domestic and aborad, but within the fields of design and industrial design. They tended to share the same frames as the rest of the group, but in one particular case it was evident that Kristin, who's an NTNU designer, and Henning who's not, had a different approach on how to look upon the users. The general belief within the design group was a user-centered design approach (see section 3.3.2.), while Henning came from a more participatory design approach. He describes the user centered design process this way.

> "...It is almost as making personas. It is very abstract, rather generic. It can help you starting a creative process, through looking at problem statements in many different perspectives, in what scenarios you believe the user will face. But it is not real. You have created it your self, it is not the same as including the users."
>
> Henning

Hennings interpretation was rather different from Kristin's. She represented what most of the other interviewee said, and uses Henry Ford as an example:

> "Henry Ford once said that if you asked the users what they would like, they would answers a horse that runs faster. None of them would have thought of a car."
>
> Kristin

She further drew this quote into the the iPhone "paradigm", and said that it probably wasn't a user who said; "I want a phone that can also have lots of apps." Her interpretation was that; "you as a designer, need to express what the product is, to create the product, and then adjust it to what people say

and think of it." Kristin believed that a person is able to adapt quickly, and used email as an example to underline her argument. "No one, or at least few people had en email account 15 ears ago, but none of us understand how we can live without it these days." This interpretation represent the designers frames about users as adaptable to changes, but it is also a statement that define the designers within the user-centered design approach (and with a slightly arrogant touch), which was most probably learnt during education. The section of inspiration can amplify the argue that the designers are within the user-centered design approach, as Staffer [2007] argues that it is an established method to think of the user. The statement fits with the interpretation of usability from chapter 3, under the section of learnability, and the learn-as-you-go principle. In Staffer [2007], the user centered design approach inhabit the philosophy that the user knows best, and that the designer is there to help the user to achieve his/hers goals. "Goals are really important within UCD (User- Centered Design approach), designers focus on what the user ultimately wants to accomplish. The designer then determines the task and means necessary to achieve those goals, but always with the users needs and preferences in mind."Staffer [2007] This way of thinking was confirmed by Kristin, as she talked of user-involvement as important, but most possible to happen in Utopia. She claimed that it is important, and that they should be involved as much as possible, and told stories about how she included the user by presenting sketches for the design. When I asked their boss about the design approach within the group, he had no proper answer to it, but augmented that his colleagues were clever persons, and that they were probably right. This can be interpretated in many directions, but as the boss has the same education as the majority of the design group, it can be stated as a frame within the group. Henning on the other hand, who has a different approach to design processes, spent a minute defending this work process in the interview.

The designers shared a frame concerning how the conference systems should be perceived as a new media, a virtual space. It was important for them that the users did not look upon it as a video-conference system with the same standards as those from the nineties, that had a bad reputation of never working, difficult to master and not with a sufficient quality of the video. All the aspects that were non sufficient from what they remember from the nineties video-conference systems are aspects that they are focused on the quality of, but also the visual aspect of making their own look both at the interface and the product design. Most of the interviewee spoke of this, but few of them were capable of putting a finger on what that made the product and interface their own. A scandinavian look of the product was mentioned. The scandinavian look should indicate quality, exclusiveness, money and trustworthiness. On the interface, most of them pointed out the "start button". (See section 4.1.1. and images from figure 1.4 and firgure

1.2) The designers told me that the selection of the name start was a well considered decision. Jens explained that due to the wish of being perceived as a new media, they did not want to use call, as they believed it refer to the phone paradigm. He further evolves. "..To be seen as a separate medium, attached to the asynchronous as post, and other similar correspondences. But it is just as starting a video. I believe that it can be seen as similar to mailing. I send you an email, a document, and in that mail you have a button that is called start video conference. As an example of not starting a phonecall, but it is still simply an escalated medium." Kristin also said that call is what Skype uses, a media they do not want to be compared with. Marie was the only one among the test-persons who mentioned at the summary that it reminded her of Skype. I do not know how many of the participants who frequently use Skype, but I will assume that it is reasonable to believe that the designers have succeeded, as they wanted the interface to refer to iPhone frames, and not Skype, and that the answer rate on iPhone was higher than the answer-rate to Skype.

Other colors that were chosen for the interface was black, white and grey, but also purple and blue. On a question about this, Anders answered:

> "We learnt at industrial design, that black and white signalized high-end."
>
> Anders

When asking about how the system support learning, none of them were able to answer. Even so, it appears as it is an implicit knowledge about it, but they place it under the category of "utilgivelige handlinger" (unforgiving actions), and the notion of what to do when and at what time. When the interface was under construction, the designers constructed a scenario of what they saw as the most relevant actions from beginning to start, building the system with what they saw as the simplest and most used function first, then the second most used function on the second button and so on.

I was curious to examine whether there were any social groups among the persons chosen for my research. One of the questions were the affection of age, whether that alone could be sorted out as a social group or not. The last round of testing had several participants with a variety in age, and I learnt that age was not a significant factor, while previous experience was. The most significant factor was if they were used to touch-devices or not, such as smartphones, iPad etc. Lin and Silva (2004) support my findings by saying that "if an individual had used a similar technology before, it is likely that the individual will use the new technology on the basis of his/hers previous experience and knowledge and expect to see the same result."[Lin,

2005, 50]

The difference I found in experience with technological artifacts made me aware of an other difference. While going through my material, I saw that the participants' behavior at the test were different. This was not only due to how they interacted with the technology, but also how they acted towards me as a test-moderator. I first though of Blomberg et al. [1993]'s experience with interview and observation as methods(see more in chapter 2.2), and the dilemma of what kind of information your user give to you, if it is what actually happens, or what people want you to hear, or what they believe you want to hear. Based on this, I devided the group of contestants into three; the young group, the experienced group, and the old group. (It is relevant to stress that they were all given the same information of the tests purpose, and it was made explicit that they throughout the test should tell us what that came to their mind, concerning the functionality and level of difficulty. They were also explained that if what they tried to do went wrong, it was due to bad design, and not their skills.) The people in the young group had different backgrounds, all of them with higher education, but stretching from computer science to medicine and economical background. The second group, got the name because they all had experience with usability-tests. Most of them had attended one before, or had a course at the university that had stressed its relevance. They knew that it was important to me to get as much information as possible, and I believe that they thought I would appreciate if the found problems with the design. This was a different approach to the test than the other groups had. The members of the experienced group shared a frame of how to act at a test, as they for instance, spoke more freely, and when something went wrong, they made sure that I was made aware of it. They explained their thoughts in detail, tried to make sense of the existing functionality and came up with solutions of what they thought would fit better. When we spoke of the test and the systems after the test, they once again reminded me of what they had perceived as illogical, as well as they complimented what they liked. This showed a frame of how to act at a usability test, both toward me as a test moderator, and towards the system. Both of the other groups had to be reminded that it was important that they shared their thoughts, and I had to ask questions in order to make them start talking. The old group was the biggest contrast to the experienced group. They were less good at pointing out what was difficult with the system, we had to ask questions in order to learn about their impressions and thoughts.

All of the participants agreed that they needed more time to fully understand and learn the system, it was a difficult in the beginning.

"It is ok, but a bit confusing. I guess I will understand it after a couple of times"

Hedda

"Not very intuitive, but understandable. "

Martin

4.6 Psychic prisons or reframing

«Frames typically operate in the background, and can have both facilitating and constraining effects» [Orlikowski and Gash, 1994, p.176]. Depending on what you have experienced earlier, the knowledge you bring with you can help you to understand how to operate or how to create a meaningful use of a technological devise. It can also have the opposite effect, and cause obstacles for a persons mind, in the way that people are unable to reframe. Orlikowski calls them psychic prisons, which inhibit learning, because people are not able to look at old problems with a fresh eye and use different tools to solve their old problems. Orlikowski and Gash stress the relevance of institutional frames can produce cognitive inertia, which can prevent organizations from adapting to a changing environment. A user's frames will be embedded the persons routines and habits, and experienced as natural, and taken-for-granted solutions. While examining peoples technological frames, one can track the meanings people ascribe to information technology over time and their changing expectations of technology. [Orlikowski and Gash, 1994, p.200]

Minsky does not use the term psychic prisons, but he too addresses that it can be difficult to mash together an old frame with a new situation. The process of choosing the "right" frame is a complex system, where Minsky also stresses that the relevant frame may contain "a great many details whose supporting is not specifically warranted by the situation."Minsky [2009]. He has an understanding on how we use frames, and how they reveal themselves, or in the moment of being taken in use, and exit through a *terminal*. This is a critical point, that makes it possible to coordinate information gathered in different viewpoints. The obstacle for the actor is that these terminals are already filled with default assignments, eg. a convention from the society. When we can't use a proposed frame, when it does not meet its suitable "friends" in the terminal, we have to find a new frame to match it with. "The matching process is partly controlled by information associated with the frame (Which includes information about how to deal with surprises) and partly by knowledge about the system's current goals"Minsky [2009].

In the test, we entered quite a few situations were it was evident that the test-persons used an old frame in order to solve the given task.

> "Arrows symbolize complexity, and should be used when there are several participants."
>
> Martin

Martin was reframing as he was using an old frame that told him that arrows symbolizes complexity, and in order to give the new situation meaning, he applied that frame into the new situation. He was using what he saw, and with the aim of his task in the back of his mind, he looked for places to find answers.

When we experience that a frame does not mach with another frame, and we are able to find a new frame in our "frame web" (Gioia's (1986) interpretation of frames as a web of meanings), and team it up with another frame, we create a new frame. This is the process of re-framing. Re-framing also include the process of *learning* (see chapter 3.2) and mashing the new knowledge with an old frame. This process is dependent on the ability of *perception.*(see chapter 3.2)

4.6.1 Interface

It became evident through the test that the contestants had different understanding of the borders of the interface. This was most evident when Ocean was tested, and not when T3 was tested. At T3 they all had the same problem with finding the right button to end the presentation mode, but that problem can also be linked with the usability of the system. In the test, there were three persons who owned an iphone. When Martin were to start his test, the system was allready "woken up", but when Hedda and Sebastian were to "wake up" Ocean, both of them tried to press a small circle at the interface, a place that holds no function to this date. It is hard to see that it can be a button, it is only a circle in the steel that does not give in for pressure, or afford anything. Either way, both Hedda and Sebastian tried to press that spot, in order to wake up the system. I see this as an iphone frame, where you press the circle outside the touch interface, in order wake up the system, or exit an application. Both Hedda and Sebastian pressed at the interface when they got no reaction from the imagined button. It is possible to say that they were able to reframe, and use another technological frame in order to wake up the system.

Most of the contestants were asked to mute the conference. In the old group, they all searched under *more*, without any luck. Most of them had

to be told to look outside the interface's border, and then they managed it without further help. Christian (one of the participants from the older group) stood out, as he was told to look other places a couple of times, but constantly went back to the interface, and searched under *more* to find the mute function. Because he was not willing to test any functions on the outside of the interface, but kept coming back to *more*, I can argue that he was kept in a *psychic prison* as Orlikowski speak of, unable to re-frame and test new things, due to an expectation of the functionality's location. We eventually pointed at the volume marker and the mute button, and asked him why he never tested them. Regarding the volume marker, he had no answer, and mumbled that he most probably did not see it, but when we asked about the mute function itself he stated "What, that one? It looks like a glass of beer." We all had a laugh, but putting that aside, it revealed that he may just suffer from poor sight, but as there were no other examples of that during his test, I will state that he was trapped in his own psychic prison, so focused at the given task and what he expected to look for, that he did not notice the volume control. Is also revealed that Christian did not share the same frame as the designers when looking upon a symbol as a microphone or a glass of beer. The symbol used is the same as iPhone use for microphone.

Defining the borders of an interface is also a discussion among theorists. The term has been borrowed from chemistry (Eikenes [2010], an was seen as a surface forming a common boundary for two entities. In the 1960's the term was taken in use in computing, but used to describe the points of interaction between independent electronics circuits as well as between computers and external devices. Eikenes [2010]. In other words, it is only recently that it has been taken in use to describe the interaction among humans and computers.

4.7 Dynamic shift in frames

In the article Technology Frames and Framing (2002), Davidson found in her research that the influence of frames was dynamic; They shifted in degrees of importantness, which directed the projects participants in different directions. «Examining frame-shifts helped explain how organizational change and shifting participation in the project influenced participants understanding of project requirement and disrupted their provisional agreements. «[Davidson, 2002, p.332]

When I conducted the UX test and while I was interviewing the designers, I found a conflict in the mind of the designers, between old and new options. I believe this is due to shifting frames, as the technology has developed, and

boundaries has been changed. I found that the designers seemed to be in conflict with the first thought of what the system should contain and signalize, from inspired by iPods simplicity, to the rich diversity of apps and iPads many opportunities. Kristin stated that she had been dazzled by iPods clean and simple design, devoted to its one function, to create a good mp3 music experience. She told me that this was brought into the design process, and that she wanted the design to interface look "damn simple", but continued with talking of how to evolve the interface. This was not only due to iPod as an inspiration source, but also because, as all of the designers pointed out, the product is for the executives, who have little or now patience when it comes to technology, and where failure is taken much more seriously than in other environments. All of the designers also stressed that it is important that it did not look difficult to operate, but still be a high end product, in order to make the executives want and dare to take use of the systems. Kristin told me that it would be cool if they were able to create a interface where the updates could, for the users eye, happened "auto-magical". "The same way as Facebook redesignes their pages, or Coca-Cola changes their logo. Sometimes you don't notice it, or other times it just happens, and then you have to learn how it works." Kristin. This has brought them into a design issue of combining the simplicity with the possibility of personalizing and thereby making it more alike a iPhone, where "There's an app for that", referring to that any given function is possible, there's an app for it on the app-store. None of the designers mentioned it as appstore, but that they needed a port to the web where any wanted function could be found. Henning used email as an example, Kristin mentioned the web in it self, and examplified it with youtube or other social media, whatever needed in the situation. Jens also addressed this issue, of deciding whether they shall design for the future and make room for functionalities they think will come, or whether they shall design for the present solutions, and make the best out of them.

Davidson also found that it mattered who's frames that were presented. Frames that were held by people who had more power, or who where looked upon as higher weighted than other members of the team, would have more influence than the others participants frames in group decisions.[Davidson, 2002, p.332] She also found that when the developers were presented an idea based by the CIOs frames, they converted the idea into something that was consistent with their own frame at the same subject. This changed the original idea, and gave the developers more power in how the outcome would look like. By doing this they spread the power, and constantly changed the original idea. But frames that are under development, or just individually held and not established in the group, will easier shift when participants in a project changes.[Davidson, 2002, p.332]

4.8 Technological artifact as a frame

Orlikowski and Gash do not look upon the technological artifact as a frame, their focus is mainly on the socio-cognitive.[Davidson, 2002, p.331] Based on my finding from the usability test, that experience with similar technology served a vital function for success with Ocean and T3, I will argue that technological artifacts serve as frames. Each system has its own functionalities, and I found that the amount of knowledge you have about technology, increases the possibility of learning a new system. Another argue that Davidson talks about is that technology is created by humans, and therefore become a social artifact that reflects the creator(s) frames, both their values, knowledge and interests. This will be visible through the artifacts material and functionality. Davidson [2002] argue is supported by Eikenes [2010], who also address that an interface should be seen as a cultural and semiotic (see appendix) artifact, as much as a technical and functional one. When talking of inspiration sources, I found several aspects that pointed this out, eg. the material for the systems, which was deliberately within the Scandinavian trend. This selection of material was something that the designers were highly conscious about, and it was mentioned in several interviews.

> "We have had a focus for our products to symbolize honesty, and the choice of material is important that process. It is easy to perceive what the products are made of, we haven't used plastic that does not look like plastic. Honesty is a part of the Scandinavian heritage. ... The use of wood is easy to perceive. In addition, we have chosen steal and wood, which is a symbol for a desire to signalize a premium product. Traditionally, the products of Tandberg have been extremely expensive, so it is important that the users get a premium feeling when they interact and see the products."
>
> Jens

> "We build on the Scandinavian idiom. Simple, straight lines, nothing extra. I believe that one of the key features of the product is to symbolize premium. "
>
> Ida

> "T3 afford cash. Old money. Quality. Details. "
>
> Henning

The material was one place where the technology referred to established frames, but the touch interface was rather dependent on established frames from other technological artifacts. The designers viewed their frames from where they gathered inspiration, and the test-persons viewed their technological frames from how they made use of the system, which became evident at the example of keyboard, search, phone book, and content. Based on my research, I tend to agree with Davidson, and chose to look upon technological artifacts as technological frames.

Chapter 5

The elements of technological frames

Orlikowski and Gash's definition of technological frames is a wide definition which I have tried to dig further into, through other definitions of frames. Throughout the text of what technological frames are and how they operate, there have been many comprehensive terms used, which has made it even more complicated to define what technological frames are. Words have repeated themselves through the text, and also in my examples above, are knowledge, understanding, expectation, anticipation. Mental models have also been mentioned. Within my interpretation of technological frames, all of these words or concepts are interrelated. To brake the concept of technological frames further down, I will give an introduction to which elements within these words I see as frames, and which parts of the words that does not fit. There have been written many books and articles about each subject, and I will not be able, nor is it my intention, to give a full insight to the fields. I have chosen to use the an online dictionary (http://dictionary.reference.com) as a way of unfolding the terms, and give an insight in how comprehensive they are. I will start with knowledge. Nonaka and Takeuchi's perspective of tacit and explicit knowledge could have been interesting to look at, but I have chosen to look upon tacit and explicit knowledge as a part of a person's frames. I believe that the test-persons exposed both tacit and explicit knowledge during the tests. When they hesitated and needed to think through what they were doing, I saw that as a representation of using explicit knowledge. When they explained why they chose one or another method, they were forced to make their knowledge explicit, or at least expose their frames, whether they were conscious about them or not. As for the designers, the aim of the interviews were to know more about their knowledge, both the tacit and explicit. I will not differentiated between them, as I saw all information gained from the designers as interesting, and that the difference between tacit and explicit knowledge was not of relevance. As stated above,

my purpose is to open the concept of what technological frames contain. I am using the DictionaryReference [2011] definition as a natural starting point for a discussion, which also serve as a opener to the comprehensive world of each term.

5.1 Knowledge

knowl·edge

[**nol**-ij] Show IPA

–noun

1. acquaintance with facts, truths, or principles, as from study or investigation; general erudition: *knowledge of many things.*
2. familiarity or conversance, as with a particular subject or branch of learning: *A knowledge of accounting was necessary for the job.*
3. acquaintance or familiarity gained by sight, experience, or report: *a knowledge of human nature.*
4. the fact or state of knowing; the perception of fact or truth; clear and certain mental apprehension.
5. awareness, as of a fact or circumstance: *He had knowledge of her good fortune.*
6. something that is or may be known; information: *He sought knowledge of her activities.*
7. the body of truths or facts accumulated in the course of time.
8. the sum of what is known: *Knowledge of the true situation is limited.*
9. *Archaic* . sexual intercourse. Compare carnal knowledge.

Figure 5.1: DictionaryReference [2011]

Knowledge is awareness, as of a fact or circumstance. When dealing with technological frames, a person can have awareness of how to operate the given artifact. In order to have awareness, one have to have experience with the system. Awareness may also be where and how to find the necessary to reach your objective, this can be gained through a manual, internet, a friend/colleague, or other information sources. Awareness in general does not fit Orlikowski and Gash's interpretation of frames unless it appears as experience, and can give you the accurate knowledge you need to solve a

problem. To be aware of that an answer to your problem can be found after a quick search on the internet, is not a possibility for a person within Orlikowski and Gash's Technological frames, unless the actor has experienced it previously, or have been told by a second person that it is possible to find a solution through a quick search.

Acquaintance can be a person you know but is not your best friend. Dealing with knowledge, acquaintance is knowledge of many things. In the matters of technological frames and Ocean and T3, an example is when the test-persons had used video-conference systems before, but not exactly Ocean or T3. For Orlikowski and Gash, acquaintance has little to offer technological frames.

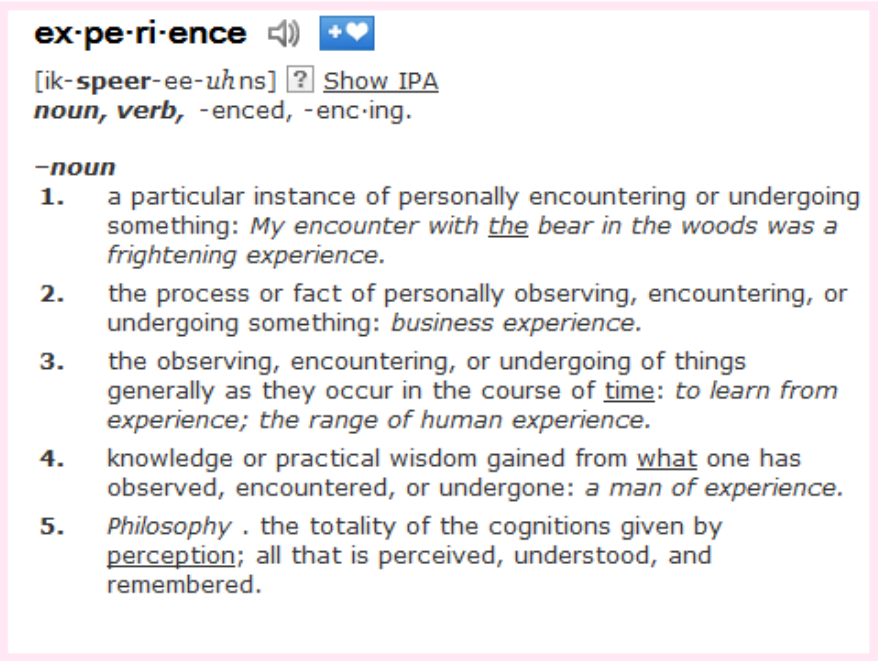
Knowledge can also be about where and how to find the right information. This is related to experience, but is also relies on conventions that can make you able to assume and expect something. Knowledge of where to find the right information can, as mentioned above, be seen as awareness or understanding, based on experience. From the Western societies we are familiar with the *"i"* as a symbol of where to find information. This sign has been brought into technology as well, where we also have other signs that symbolize further information, such as arrows and more. Knowledge as understanding and experience can be applied to Orlikowski's interpretation of frames. I see experience as very alike to knowledge, as knowledge often is gained through experience.

5.2 Experience

Experience as a former event, either through observation, fully or partly participation, is included in Orlikowski's interpretation of technological frames. This is what most frames consist of.

Words as background, familiarity, acquaintance, knowledge, training and sense are some of the synonyms mentioned by DictionaryReference [2011]. Familiarity, acquaintance and knowledge are part of the term knowledge, and being embedded in this definition of what experience is, strengthen the link between knowledge and experience as terms. Experience is also much more. Experience can be understood as practice, routines and authority. Gundersen [1984]

Experience as practice and routines can be how one have repeatedly gone through a sequence. Within technological frames, this can eg. be how one have dialed a phone number numerous times. Within this angle dictionary.com's definition of experience as training can be applied as a syn-



ex·pe·ri·ence

[ik-**speer**-ee-*uh* ns] Show IPA
noun, verb, -enced, -enc·ing.

–noun

1. a particular instance of personally encountering or undergoing something: *My encounter with the bear in the woods was a frightening experience.*
2. the process or fact of personally observing, encountering, or undergoing something: *business experience.*
3. the observing, encountering, or undergoing of things generally as they occur in the course of time: *to learn from experience; the range of human experience.*
4. knowledge or practical wisdom gained from what one has observed, encountered, or undergone: *a man of experience.*
5. *Philosophy* . the totality of the cognitions given by perception; all that is perceived, understood, and remembered.

Figure 5.2: DictionaryReference [2011]

onymous to routines. When applying experience as practice or routines, it is easy to fall into the paradigm of psychic prisons Orlikowski and Gash [1994], because one has standardized a way of solving a problem through a period of time, and therefore have difficulties finding or testing new methods. The experience given through practice and routines can also be a facilitator, because a person is conscious about his goals, and therefore is able to let other frames merge with the goal and the practice of the routine to give meaning to the new situation or device.

Experience through background is an element baked into technological frames. Background can be of many sorts, education, family, cultural, historical, etc. Background can eg. be experience with similar technologies, that helps you to take advantage of the new system introduced, either through education or significant use eg. in a work situation.

Experience as one persons authority has little to do within the concept of technological frames in Orlikowski and Gash understanding. Davidson Davidson [2002] spoke of how persons with authority may affect the creation of frames. I have not given experience as authority much concern in my interpretation of technological frames. I do not think of this as a relevant

aspect for the thesis. I didn't see any particular examples of it when looking through my material, everyone interviewed for the thesis at Cisco were employed at the same level, and those who participated at the usability test related to me during the test. The testers followed my instructions without much questions, and if they had questions related to the system functionality, they expected me to have answers. In that matter, they saw me as a person with authority and experience, and it is valid to say that I had authority in those matters, but my position as a person with authority in that situation can also be due to fact that I was test-operator.

5.3 Understanding

un·der·stand·ing

[uhn-der-**stan**-ding] Show IPA

–noun

1. mental process of a person who comprehends; comprehension; personal interpretation: *My understanding of the word does not agree with yours.*
2. intellectual faculties; intelligence; mind: *a quick understanding.*
3. superior power of discernment; enlightened intelligence: *With her keen understanding she should have become a leader.*
4. knowledge of or familiarity with a particular thing; skill in dealing with or handling something: *an understanding of accounting practice.*
5. a state of cooperative or mutually tolerant relations between people: *To him, understanding and goodwill were the supreme virtues.*
6. a mutual agreement, especially of a private, unannounced, or tacit kind: *They had an understanding about who would do the dishes.*
7. an agreement regulating joint activity or settling differences, often informal or preliminary in character: *After hours of negotiation, no understanding on a new contract was reached.*
8. *Philosophy* .
   a. the power of abstract thought; logical power.
   b. *Kantianism* . the mental faculty resolving the sensory manifold into the transcendental unity of apperception.

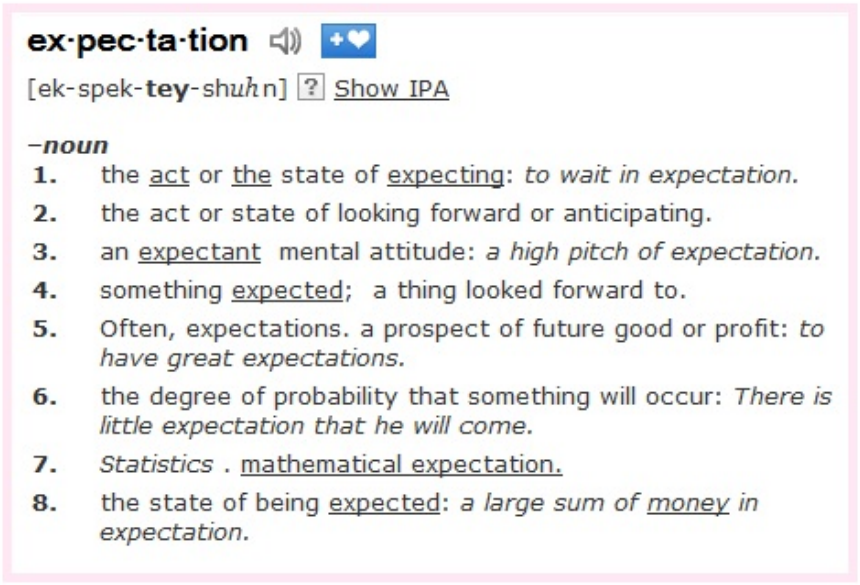
Figure 5.3: DictionaryReference [2011]

I have chosen to use the definition of the term understanding, instead of the word's infinity form to understand. This is because I want to keep focus on the process of when a person is in the mental process of understanding. The term is wide, and I will focus on those elements that are significant for technological frames. The ability to gain understanding is one of the key features within technological frames. The frames are there to help us to understand, or as the dictionary states it; to grasp the idea of how to operate a device. When you subscribe meaning to a feature or device, you apply your existing technological frames and thereby create an understanding of the device. Orlikowski and Gash's interpretation of technological frames as an analytic tool see understanding as a fundamental base. All of the analytic tools they developed after their study in Alpha Corp., were based on creating an understanding of how and why the system was implemented, and why and how they could see themselves use the system in their everyday work life. They rely on the user to gain understanding or are being made aware of what they can use a system for, or to a minimum accept what the goal of their organization is.

Understanding as a mutual agreement can be seen as frames made by a social group. A mutual understanding of why the menu structure should be ordered in a given matter, was a frame exposed at the interviews, within the social group among the designers at Cisco. None of the participants at the usability test, nor I, noticed the structure at the menu, while Anders, Kristin and Jens all pointed out that the menu had a thoroughly considered structure. They saw it as a obvious design decision, while I never noticed. This can also be seen as a design solution, due to usability.

The design group exposed a shared understanding of their workprocesses, as we spoke of design processes. It became clear that the understanding was founded in their educational background. They used it more as a guideline than a resource, and it was only Henning who were able to see how this understanding had been internalized the workprocess of the group.

Technological frames where understanding appears as a philosophy, is an appropriate way of looking at frames within the glasses of Orlikowski and Gash. Looking at a philosophy not only as a power of abstract thinking, but as a way of creating logic, is how one may say that frames operate. This can have both facilitating and constraining results. If the philosophy helps you to give meaning to a situation, it can be facilitating, but your interpretation of the situation can also be constraining due to your philosophy.



ex·pec·ta·tion

[ek-spek-**tey**-shuh n] Show IPA

–noun

1. the act or the state of expecting: *to wait in expectation.*
2. the act or state of looking forward or anticipating.
3. an expectant mental attitude: *a high pitch of expectation.*
4. something expected; a thing looked forward to.
5. Often, expectations. a prospect of future good or profit: *to have great expectations.*
6. the degree of probability that something will occur: *There is little expectation that he will come.*
7. *Statistics* . mathematical expectation.
8. the state of being expected: *a large sum of money in expectation.*

Figure 5.4: DictionaryReference [2011]

5.4 Expectation

A frame tells you how to operate in a given situation, it also tells you what to expect when you enter a situation. This way, one can say that expectations is a result of the outcome of a person's frames. Expectations as a method of looking forward and anticipate, can help a person to chose the right frames, or control what will happen when a certain frame has been taken in use. A person who expect that a situation should end in one way will choose to use the frames that can affect and give the outcome of the situation after the given person's expectations. The way two persons choose subjects to talk about in a given situation or context, affects the outcome of the conversation. The interlocutors follow certain conventions about what it is appropriate to ask about in the given context. As frames are individually held, expectations are also individual and can vary between two actors, which can become a challenge for a person who is approached either by a theme or situation he did not expect.

The situation in the usability test where the test-persons used the search area, exposed many expectations gained through previous experience and knowledge. It also revealed that in this session, most of the participants, and the designers, applied their frames as a set of fixed solutions on how to solve a problem: The designers who had not thought about creating a

possibility for search, both on first and last name, and the participants who thought something was wrong with the search when it did not give them options as they were typing.

Orlikowski and Gash argu that mental models are a part of technological frames. It is about time to give mental models a proper introduction;

5.5 Mental models

Rogers et. al describes mental models as a process of how a user develops knowledge of how to interact with a system, and how they understand how a system works. A person's mental model will grow as their knowledge of how to operate the system and its functions expand. Within the cognitive psychology, mental models have been assumed to be internal constructions gained from the external world. The internal constructions are personalized, through a manipulation of the external world. This manipulation enables a person to make predictions and interference.Rogers et al. [2007]

> "Mental models give you a deep understanding of peoples motivations and thought-processes, along with the emotional and philosophical landscape in which they are operating."
>
> Young [2008]

Young states empathy as a cognitive tool to not strictly study how a person uses something, but into knowing what's a person want to accomplish. He underline that in order to understand what a person need, you have to know their goals, and what procedure or philosophy the person uses to archive her goals.

People often use wrong mental models, this can be done both consciously and unconsciously. A person might turn the heat extremely high, thinking that the room will be warmer quicker than if the thermostat is set to a lower, but eventually wanted temperature. Another example is how people push an elevator button several times, thinking that the elevator will arrive faster by doing. Many people are aware of that none of the examples help, both the electricity and the elevator will use as much time as they need, but keep doing it anyway. Why do we choose to do it wrong when we can do it right? With low understanding of how a technological artifact work, the mental models become incomplete, easily confused with others, and people find it difficult to solve a problem, identify and describe the issues. They may lack words or concepts to describe what's happening. The process of

choosing wrong mental models is similar to Minsky's process of a frame exiting a terminal. Why an actor keeps choosing the wrong mental model can be understood as the actor's inability to reframe. In addiction, people often have a tendency to test a frame several times, in order to know that it wasn't the machine's response that was wrong, but the actors act. Sharp, Rogers and Preece suggest transparency to help users gain knowledge about the system. The Transparency includes 1) to give useful feedback in response to user input, 2) easy-to-understand and intuitive ways of interacting with the system.3) clear and easy-to-follow instructions, 4) appropriate online help and tutorials, 5) context-sensitive guidance for users, set at their level of experience, explaining how to precede when they are not sure what to do at a given stage of a task. [Rogers et al., 2007, 118] There is also the dilemma of how much transparency is useful for the users. This is a discussion the designer needs to take, depending on their user group.

Young has arranged mental models as affinity diagrams, where information or behavior has its own section(s), that is later grouped together with other sections, with the appropriate group or definition. This is similar to Orlikowski and Gash's web of meanings, but slightly more elaborated.

I look upon basic cognitive abilities as a necessity for an individual to be able to operate technological frames. They are the foundation for the concept, and deserve an introduction. I will not try to cover the whole field of cognition, I have chosen to emphasize those cognitive processes that I see as the most vivant for technological frames.

5.6 Cognition

There is a jungle of different definitions of cognition, but I have chosen Sharp, Rogers and Preeces (2007). I have chose theirs because I found it simple and suitable for my purpose.

> «Cognition is what goes on in our heads when we carry out out everyday activities. It involves cognitive processes, like thinking, remembering, learning, and daydreaming, decision- making, seeing, reading writing and thinking. »
>
> [Rogers et al., 2007, p.94]

There are many different forms of cognition, and it occurs in different processes. Sharp, Rogers and Preece mention;

- Attention

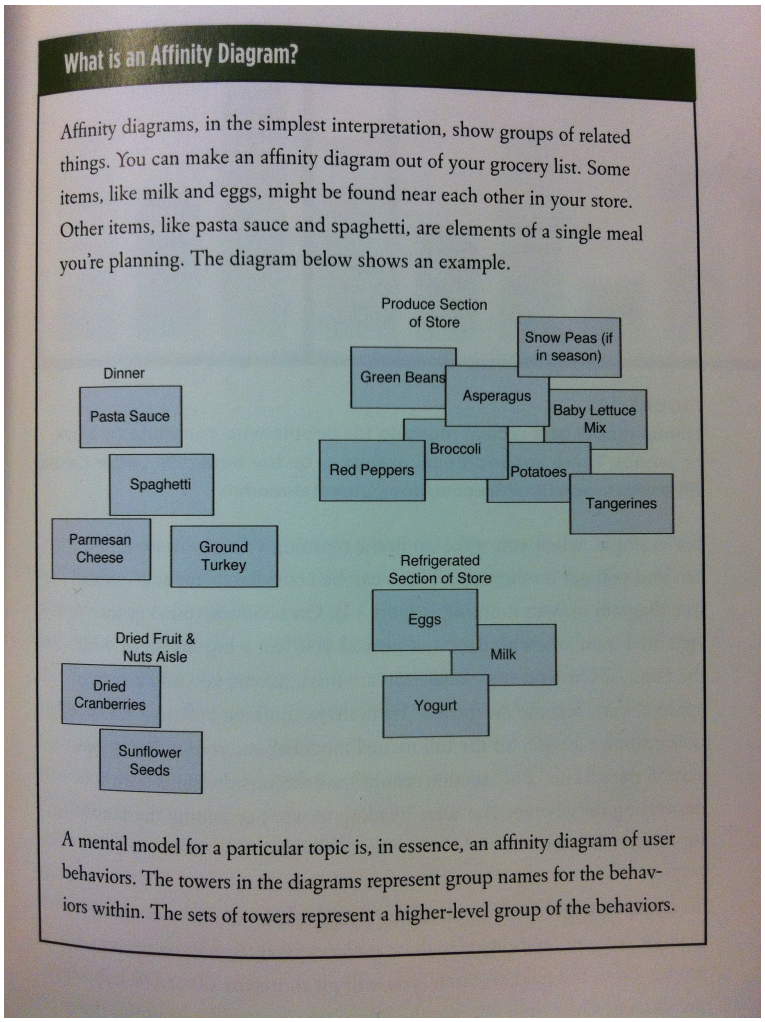


Figure 5.5: AffinityDiagram

- Perception and recognition
- Memory
- Learning
- Reading, speaking and listening
- Problem-solving, planning, reasoning, decision-making.

Before the explanation begins, it is important to state that all processes can occur at the same time, and be dependent of each other in order to start functioning at all.

5.6.1 Attention

Attention focuses on the process of paying attention to a specific artifact, at a given time, and when other possibilities are present. It includes both audio and visual senses. How well you center your attention, depends on the clearness of your goals, and wether the information you need is salient in the environment.[Rogers et al., 2007, p.95] When we don't know exactly what we are looking for, we have to use the environment and use existing information in our mind, to find places to search for information, and then conclude with a goal. An example could be an airport situation; you have newly landed and have a goal of getting into the city. How we decide on how to get to the city, depend on what we know from before. If a person is used to going by train, he or she will most probably look for a train-station, or sign, but if the person is used to bus, he or she will look for a bus station and a bus-sign. If you are used to both possibility, one might be interested in the duration of each travel possibilities, and the cost of each possibility before making a decision. How the information is presented will most possibly affect the decision, whether the information is salient in the environment. In other words, the attention will be steered by the actors knowledge of what to look for, just as we chose which technological frame to chose when we occur in a new situation.

5.6.2 Perception

Perception refers to how a person gains information from the environment, through the eyes, ears, fingers, nose, mouth, and how we transform an experience into knowledge. In order to do that, we are dependent of several cognitive processes, such as memory, attention and language. When focusing on interaction design, vision is the most vivant source. It is important to present information that is easily and rapidly perceived for the eye. Sharp, Rogers and Preece exemplifies with white spacing. Information grouped with white spacing between each border row is easier perceived than information separated with color. The authors also underline that icon and other graphical representation should enable users to rapidly distinguish their meaning. The same matters for sound, it should be easy for the user to understand where the sound comes from, what it represents and how the user can get rid of it. Tangible feedback used in virtual environments should allow users to recognize the meaning of various touch sensations being emulated. The feedback should be distinguishable so that, for example, the sensations of squeezing in a tactile form that is different from the sensation of pushing.[Rogers et al., 2007, p.101]. The knowledge of perception has been brought in to the usability literature. Go to section 3.4 to read how they have become principles. «A general design principle is that information needs to be rep-

resented in an appropriate form to facilitate the perception and recognition of its underlying meaning.»[Rogers et al., 2007, p.99]

Selective perception

In the introduction, Plous (1993) writes about how you might look at an artifact in an un-biased way, but it is nearly impossible, and people rather selectively perceive what they expect and hope to see.

Bruner and Postman (1949) conducted an experiment on selective perception. They used playing cards as an example, and found that people used four times longer to recognize a trick card than a normal card. They also categorized the most normal reactions to the different card in four types; Dominance, compromise, disruption and recognition. A dominance reaction is also called «perceptual denial», where a person choose what information sent is the most relevant. Brunes and Postman gave the test persons a tricked card, a hearts three, where the color of the hearts and number was painted black. They saw that people either chose the form as dominant, and color assimilated to prior expectations, or they chose color as dominant and form assimilated. [Plous, 1993, p.16]

When people compromised, they reported a red six of spades as a purple six of spades, or a purple six of harts. Half of the scientists subjects showed compromise reasons to red harts, and 11 percent showed compromise responses to black hearts.

There is only a small percent who react with disruption. When that happens, people have trouble forming a perception of any sort. (ibid: 16) They get all put out of action, doubting their own judgements and memory. One test person said; «..I don't know what color it is now or whether it's a spade or a harts. I'm not even sure now what a spade looks like. My God!» The last reaction was recognition. Before seeing what was wrong, the test persons saw that something was wrong, and detected faults by the card as eg. That the spades were turned the wrong way, when it was the color that was the actually fault. The results of the study show how strong expectations can influence perception, and when people have a lot of experience with a situation, they tend to see what they expect to see.

There have been conducted many studies where a group of persons have been given medicaments, alcohol etc, believed to have an effect on the body. Most of these researches have seen that people who think they are given something that should create a change, believe they experience the change, while those who are given medicines, but don't believe it should have any

affect, don't recognize the effect. In other words, «..expectations are proved more important than changes in blood chemistry»(ibid: 17)

The author concludes that perceptions are selective, and that a person should take a discussion with her/himself before making a decision or an important judgement. Questions to answer one self is: Am I motivated to see things a certain way? What expectations did I bring into the situation? Would I see things differently without these expectations and motives?

5.6.3 Memory

I see memory and perception and the way they function as such an important part of how technological frames work, that I have chosen to give it its own section, while learning is only spoken of where it occurs, as well as reading-speaking listening and attention.

Memory is how we remember someone's face, or how to perform a given task. It is not possible for us to remember everything that we see, hear or smell, taste or touch, and we therefore filter the information and decide what information we want to remember. This can of cause fail, as we from time to time forget what we were to remember, and remember what we had filtered to forget. As Orlikowski and Gash state, Rogers et al. also state: *Context* can be a reason why people don't remember what they want to remember. In some situations, we don't remember what we long to remember because we are in another context than the one we want to perceive the information from. Plous [1993] describes it as "People do not memorize sentences, they memorize a general scenario. Once a piece of information is integrated with others, it is sometimes difficult to remember which information was new and which was already known.»[Plous, 1993, p.34].

People also have difficulties of knowing how they will react on information about an outcome. For example, if people learn about a psycological experiment, they tend to regard the findings as predictable, or at least more predictable than they would have judged before learning about the experiment. This tendency is recalled as a hinsight bias, better known as the «I-knew-it- all- along» effect. Hinsight biases is the tendency to view what has already happened as relatively inevitable and obvious- without realizing that retrospective knowledge of the outcome is influencing one's judgements. [Plous, 1993, p.35]

Ian Hunter (1964) conducted a study in order to check what people remember, and how they remember. He called in a group of people, and held a discussion. The discussion were well documented with audiotape. Two weeks

later, Hunter contacted all the participants of the discussion and asked them to write down what they remembered of the discussion. Respondents remembered comments that were never made, and transformed casual remarks into lengthy orations, and they converted implicit meanings into explicit comments. This story does not only highlights the value of recording, but it also tells that even the most sophisticated decisionmaker is susceptible to biases in memory. Memory are in other worlds highly dependent on contextual factors. (Plous 1993: 37)

Sharp, Rogers and Preece stress that people are much better at recognizing things than recalling. This is an important element in a design process; design for recognizing, not recalling. When sorting files, this can be a challenge. If you are to look for a certain file at the computer a long time after its creation, it can be difficult to find, especially if you don't remember the name of it. There are two memory processes; The first one is when a person uses the memorized information about the wanted file to get as close as possible. The second one is when the user don't remember the name of the file he/she is searching for, and tries to find the right information through reading a list. If it is a websites name the user is searching for, he/she can go through his/hers history is the browser to find it, or google some parts of the information about the place or website that the users recall.

When a person is to memorize, and make a choice, research has found that most people find it difficult to remember more than three or four options. [Rogers et al., 2007, p.114]. People have different needs; those with a bad sight or who are dyslectic might want to enlarge the text, while those who are farsighted or are reading at a big screen, might prefer to get the text in a smaller size than originally. It is important for interaction designers to implement a possibility of a different visual presentations. These are important elements of the section at reading, speaking, listening, the third point at Sharp, Rogers and Preece's list.

5.6.4 Learning

I made a choice in the beginning of this thesis to leave the sociocultural perspective out, but when it comes to reading, speaking, listening, and the following section of learning, I have found it hard. The literature I have found to fit my interpretation of technological frames are within the sociocultural perspective. As it is on the outside of my scope, and only visual here, I have not written about it inparticular, except from what is represented here.

How we learn is a theory field of its own. Säljö [2006] stated that to understand learning is to understand those practices humans develop in re-

lation to mediating tools, and the common interpretation of those. I will not go further into this, but rather look at how learning occurs, and how it affects us, and thereby the creation of our frames. Learning is highly connected to experience and knowledge, and as Passer and Smith states it;

> "Learning is a way of gaining or producing experience, and change an organisms behavior and/ or capabilities. Learning also affects our emotional reactions, perception and psychological responses. Through experience we think, act and feel in ways that contribute richly to our individual identity."
>
> Passer and Smith [2011]

The process of re-framing is a learning process, and the outcome of the process is affected by both external environmental factors, but also internal psychological factors such as emotions and previous knowledge or experience. Learning occurs through habituation, classical conditioning, operant conditioning and observation. Habituation is a change in behavior that result merely from repeated exposure to a stimulus, while classical conditioning is when one associate one stimulus with another. Learning through classical conditioning is when one introduce an unknown eg. artifact along with one known artifact which inhibit certain elements or associations that is wanted for the unknown artifact. Operant conditioning takes classical condition one step further, and concerns how actors learn to associate their responses with specific consequences. I will state that the learning-by-doing process is a part of operant conditioning. Observable learning deals with how a person learn through observing others. Thinking about the design of Ocean and T3, the start and end buttons are representations of where the designers took advantage of classical conditioning and placed them together familiar elements, and gave them a new meaning in the light of context and interface. Looking at how the testers used their experience with other touch devices (see section about gestures), is an expression of how they learned to operate T3 and Ocean through not only existing frames but also operant conditioning.

The designers at Cisco had little or no thoughts of how Ocean and T3 should support learning. Even so, when learning was brought up, several of them mentioned that the system should "call to action ". By this they meant that the function should be named what the tester desired to perform, or of such a matter that the contestant understand that this button will execute that given task, Henning embedded *surprising* and *unforgiven actions* to undesired actions within the term. J. Carroll (1990) [Rogers et al., 2007] found through a study that people often find it much more difficult to learn through a manual than through exploring, and therefore argue that the possibility for

success is much higher if the learning process is designed to learn-as you-go, rather than to use a manual. Carroll stated that the interface should allow the user to explore the interface through creating several options for how to enter a page, either through eg. The menu on the left hand, or follow the link that is naturally placed under the intro text at the site. Rogers et al. [2007] underline that when designing for learning, one should create an interfaces that constrain and guide users to select appropriate action when initially learning, and to «dynamically link concrete representations and abstract concepts to facilitate the learning of complex material.» [Rogers et al., 2007, p.113]. Carroll underlined that the users always should have an undo possibility, incase the user end up at a different place in the system than intended to. The designers at Cisco shared this understanding, but they were not explicitly concerned about it, Kristin stated that "there is no explicit support for learning."

5.6.5 Reading, Speaking, Listening

Säljö [2006] argues that reading should not be seen as an activity that strictly goes on in ones mind, but as a situated activity which is a part of different operations, localized in the space between mind and text.

Which word we choose to use and how we choose to build our sentences is due to the genre context we find our self within, or the genre that we identify our self with and want to be identified with. It depends on our understanding of the situation, and our experience of similar situations and the knowledge we inhabit of the surrounding relevant elements.

Listening requires less cognitive effort than reading and speaking.Rogers et al. [2007] Even so, it is transient, which demand some sort of concentration if information is to be possessed. Listening can be placed under the segment of observable learning, if one does not limit observation to visual abilities. I understand listening as an observable ability, as it is the cognitive ability to learn from others, not only through seeing them perform a task, but also through hearing them talk of experience and (gained) knowledge.

In the bottom line, all three of them (Reading, Speaking, Listening), refer to language. The difference is how they are conveyed, and how they are perceived, based on which experience we have and the genre we are within at the moment of conduction. In some situations, it is easier to listen to something than to read, but in others it may be the other way around. The former can be while driving a car, while the other one is eg. While traveling by train. If it is noisy, it is difficult to listen to something.

If we evolve the problems of content, and look upon it in terms of reading, speaking listening, I will state that the troubles can be due to the name. It

way be as simple as that content did not come in natural for the testers. If you do not understand the word or what it is to signalize, you do not know which frame to take advantage of. When using Orlikowski and Gash analytical tools, the problem fits within the paradigm of understanding the nature of the technology, where something as simple as the selection of label name has an impact of the users perception. The testers did not have any experience with the term, and exposed troubles with trying to apply their frames. Most of the test-persons used the elimination process on this section, and looked at other elements before they tested content.

5.6.6 Problemsolving, planning, reasoning and decision-making

Problemsolving, planning, reasoning and decision-making, is the reflective cognition. This includes what to do, when to do, what the options are and what consequences that might be carried out of a given action. It relies on that people are aware of what they are thinking about, and includes a discussion with one self or others. It often includes an artifact, such as a map, calendar, pen, paper, web, etc. Reasoning also involves thinking through different scenarios or possibilities, and deciding on the best solution.

In the book "The psychology of judgment and decisionmaking" (1993) Plous state that people understand new material, events etc int the light of previous experience, combined with the context they are in at the moment. They will rarely remember events or material in isolation. This way, two similar events can be perceived differently, if they occur with space of time and an other context. Scott Plous has set up four different ways to illustrate context dependencies in judgement and decision making. These are; The contrast effect, the primacy effect, the recency effect, the halo effect.

The Contrast Effect Stanley Coren and Joel Miller conducted a research in 1974, investigating the contrast effect. They found that a normal sized sports-reporter standing next to basketball player looked very small, while standing next to a jockey looked rather tall. What that made them curious was that when the same sports-reporter stood next to a stadium or a horse, one would imagine he should look small like when standing next to the baseball player, but instead he looked normal. They conducted some new tests, and found that the contrast effect only occurs when the contrasted stimuli are similar to another.[Plous, 1993, p.41] Thinking about technological frames and usability, this perspective is valid to considerate when learning about the usergroup and how they perceive a situation or material.

The primacy effect The primacy effect concerns how we judge, or get a picture of a person. A study done by Asch, (1946), found that when

describing a person, the adverbs given early are the most influential for the impression given to others. Thinking of this statement in the perspectives of usability, it influences how a system is perceived and what overall impression the testers are left with. Norman Anderson found in 1965 that the primacy effect is wider than the first impression, and that it is a general relationship between the position an entry occupies and the effect it has on judgements. [Plous, 1993, p.42] The first impression is the most important one, but the second and third impression still has a significant primacy effect. If we look at ocean and T3, this has been an influencing frame among the designers, as they built the concept up with what the designers saw as the most basic function of the system, and also the most easily perceived and expected function, and then further evolve.

The recency effect The primacy effect stated that the first impression is the most important one, but the recency effect proves the opposite. In many situation, the last impression as the most relevant one, and that it occurs when people are able to remember the last presentation more clearly than the first one. (ibid: 42) Emil proved this argue wrong in the usability test. Due to some "bugs" in the system while he was testing, he faced more faults than the rest of the testers. After the test he was unsatisfied, and mentioned the faults from the beginning of when he summarized the test. His disgruntlement may be due to several more faults than the other testers ran into, but it was also evident that he kept his dissatisfaction throughout the test.

The Halo Effect Thorndike (1920) conducted a test on army superiors about their officers evaluating their intelligence, physique, leadership and character. Thorndike found a equivalence between different teachers evaluations. They were unable to evaluate a person simply out of one condition, the impression was built up by a variance of factors.

The solutions people draw upon are dependent on their experience within the domain, and skills. A novice will use more time than an expert, and will be looked upon as slow, and generally more inefficient in his/hers solutions during training. This may cause irritation, and make the novice act irrationally. Rogers et al. [2007] For the designer, it is important to consider the user-group, whether it will be most novices or experts of technology, but also what frames the group possess. It will have an impact of how they give meaning to, and thereby how a user will be able to, plan and take advantage of the functionality designed for. Within the design literature, there have been a lot of focus on how a functionality can signalize its purpose. It is

called affordance. It has been rich discussed, and Donald Norman (Norman [2002]) was one of the first to introduce its existence.

Chapter 6

Deeper understanding of technological frames

The previous chapter was a section of digging deeper into technological frames, in an attempt to understand the elements of technological frames. In this chapter I want to start by linking usability, technological frames and cognition together, and then continue to dig deeper into technological frames, and argue for another approach which can be more useful when applying technological frames as a tool in a design process.

6.1 Linking Usability, technological frames and cognition

When technological frames were introduced, it was because usability was seen as insufficient to cover the background for the choices made at the usability test. It is about time to link the concepts together again, and look at the similarities.

The model (6.1) is an interpretation of the link between usability (UX), technological fames (T.F) and cognition (COG). Both usability and technological frames are dependent on certain elements of cognition, while they also consist of other aspects, such as Human Computer Interaction (HCI) and Sociology for technological frames, and design literature for usability. The area within cognition that technological frames and usability share, is the elements of understanding, memory and reading which they are mutually dependent on. Technological frames are dependent on memory to remember the knowledge gained, and a subject is dependent on the ability to perceive, either through reading, hearing or sensing (dependent of the context) in order to experience. The experience is steered by our judgement and decision making which then again is affected by our previous experience of what are

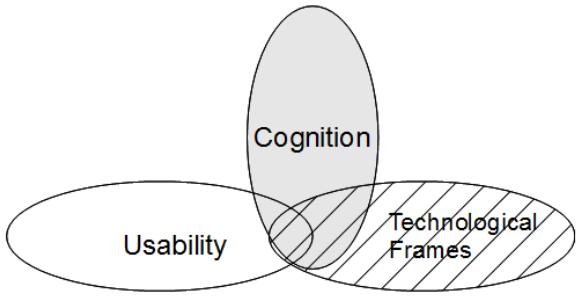


Figure 6.1: How TF, COG and UX is linked together

good and what are bad decisions.

Looking back at the usability literature, it emphasizes that a system should be perceived as useful, efficient, effective, learnable, and satisfactional. The ability to understand (T.F.) is important for how a user perceives (COG) a system's usability(UX), and how the user is able to learn (COG), and targets his goals efficiently and effectively (UX). All usability principles rely on the ability to read and keep a memory. Rubin and Chrisnell [2008] stated that in order to perceive a system as useful, the user depends on his first impression of a system. This links to the psychology of judgement and decisionmaking, and the primacy effect. The way a user is able to be effective, relies on whether the system meets the user's expectations. Expectations is a big part of technological frames, not only as a segment of its own, but is also found as a result of knowledge, understanding and experience. Within cognition on the other hand, it is not a central element, rather a result of memory and learning.

Affordance relies on whether the designer is able to signalize the object's purpose through its design. The design itself is not enough, the user depend on sharing a number of the same frames as the designer in order to comprehend what the object affords. Natural mapping is highly interrelated with technological frames. If the designer and the user do not share an understanding of what that is seen as a natural structure, or natural outputs of an input, the user will most probable be confused. This was seen at the usability test, where the testers and the designers did not have the same interpretation of what was natural action when leaving a presentation at T3.

6.2 Deeper understanding of Technological Frames; UF

The last section revealed what the concepts share, but it does not indicate that they share the same interpretation of a situation. The model 6.2 is a representation of the different perspective each concept have. The elements mentioned of cognition is now integrated in technological frames and usability.

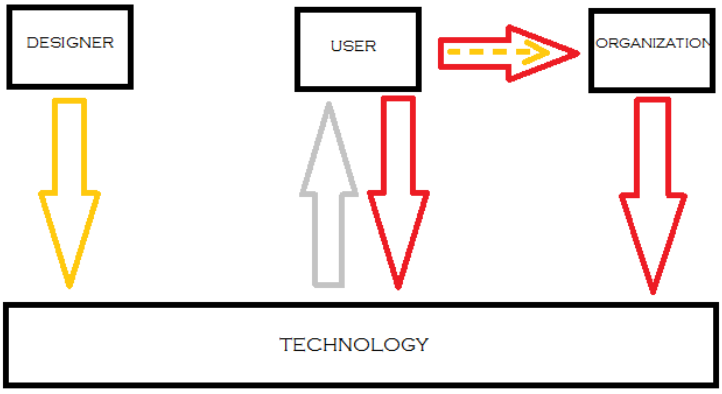


Figure 6.2: Affection and relation among the different concept

The red arrows represent Technological Frames by Orlikowski, the grey arrow is usability, and the yellow is mental models. Where usability is focused on how the technology affect the user, Orlikowski has a different approach, looking at how a user and its organization affect the technology in use. Mental models on the other hand concerns how the designer affect the technology, which mental models are taken into use during modeling and constructing the object. I will state that all concepts are too static, lacking the dynamic intersection among the subjects and objects.

In order to get a more dynamic concept, I argue for an extended and slightly different understanding of technological frames which is more fruitful for a designer. In order to separate Orlikowski and Gash's interpretation of Technological Frames from the interpretation and use that I will support, I have chosen to give it the name UF, a shortening for Understanding Frames. In this section the focus will be on the mind-set of UF.

Technological frames as an analytical tool is rather narrow, compared to the concept of frames from the general psychology. A frame is wide, and can

include every previous knowledge and experience. Technological frames as an analytical tool mainly looks at how to use knowledge to understand what you as an individual in an organization, and what that organization itself has of advantage of a given artifact. Due to the fact that the organizational aspects are kept out of this study, the focus has been mostly on how we understand and give meaning to technology.

Orlikowski and Gash concluded that lack of training was the reason why the people in the organization did not manage to use Lotus. They also concluded that the users did not have the same mental approach to learning a new system as the system developers and the management had, and addressed that it had to be changed in order to learn to operate the system. In this argue they seem to take take individual mental models for granted, as they discuss issues within the organization, which in turn are based on a individual understanding. Due to this, there is a yellow dotted line within the red arrow between user and organization, indicating the mental models affected by the individuals in the organization. The mental approach a user has of how to learn a system is important for the management, but from a designers perspective, it is more interesting to know what experience the user has, in order to make a system that appeal to the future user.

In order to make technological frames more useful for designers, another perspective of understanding how frames operate will be emphasized. If frames are looked upon as resources, it broadens the possibilities the user has of understanding a system, and it emphasizes the importance of knowing about the users experience and expectations of a system. Through knowing more about the users expectation, one can learn what genres the user find himself within, which makes it more possible for the designer to create an object the user is able to make use of. This will be further described in section 6.2.1.

In chapter four there were many examples where the users' frames functioned as guidelines. When including a view of frames as resources, it can serve as a complementary approach to how frames function. When looking upon frames as resources, it is valid to go back to the main concepts from chapter four, and discuss them in the light of UF. This will be done in section 6.4. Genres are brought in as a tool for the designers. Through being aware of the subjects genre(s), it can reveal several expectations, which then again to help the designer create the right design. The reasoning for how genres are of help is discussed in section 6.5.

The figure 7.1 is created for examining the interaction between the designer, the user and the technology. The UF model is attended to serve as a model of the mind-set within UF. It is a model for recognizing, but

also remember the dynamic affection between subjects and objects. Each segment is a representation of their inherent UF's, and the interaction that takes place is within the frames and genres that the designer, technology and user share. They are represented with circles in each box. The circles are representations of what tho remember when researching the relationship between the user, technology and designer. The first circle from the left is a representation of knowledge and experience (K&E), while the second is a representation expectations (E), and the third a representation of genres, including signs and gestures (GSG). The fourth circle has a different meaning to the designer and the user on the one hand, ad a different from a technological view. For the designer and the user, the circle represents the human ability of learning, a vital function for how new frames are shaped. The circle in the technology box represents usability, with an emphasize on how the UI (User Interface) communicate its purpose and abilities to the user. The model is also a representation of whenever there is a lack of understanding of a technological device, it may not be due to poor usability or a stupid user, but due to a lack of mutual frames of what a feature possesses.

6.2.1 Including the designer

Within interaction design and HCI, there is a saying that you as a designer should know your user. [Rogers et al., 2007] Within the HCI environment knowing you user has been emphasized by many authors, such as Rogers et al. [2007], Rubin and Chrisnell [2008], Shneiderman and Plaisant [2009], and at every HCI and design course I have attended at the University of Oslo, articles and books that emphasize this argue has been on the curriculum. There are several methods available for how to know your user, Patnaik and Becker [1999] wrote an article proposing methods of how to find our users' needs. The focus on the user is important, but through this analysis, it has become clear that when conducting research on Human Computer Interaction, focus on the designer is evenly important as the focus at the user. Not focusing on the designer's frames is an underestimate of their impact. This thesis has shown that the designers' frames are represented in the interface of the technology, and that their genres has a high level of impact of the GUI (Graphical user interface [Network, 2000]). Through knowing more of the designers' frames, one can learn why the interface ended up with its GUI, which is also a source for detecting why the users and the designers are not able to communicate through the interface. This is often seen as bad usability, while it can be due to different frames and genres. The thesis has shown that the technology serve as a frame of its own, and that it is a part of creating UF.

When designing, it is not necessary to establish what your frames and

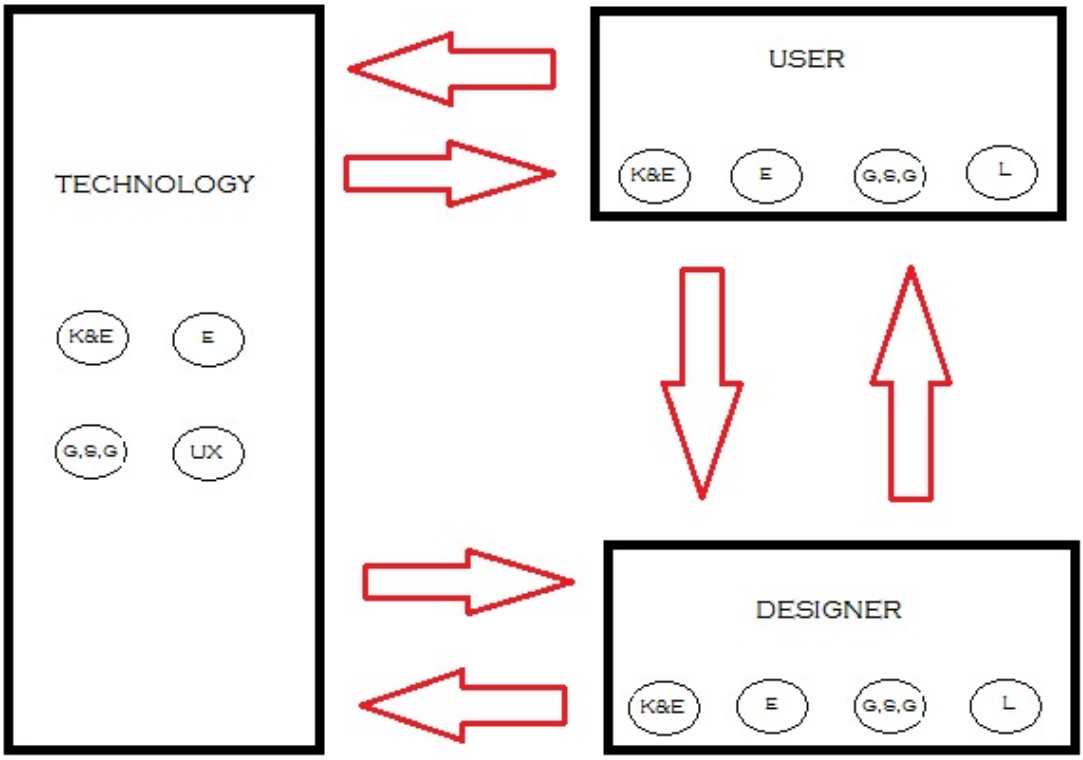


Figure 6.3: UF relationship between user, designer, technology

genres are, but being aware of the differences, and seeking the genres of the users, can help the designer to move from designing what's cool, to what's cool to the users.

6.3 Technological Frames as resources

Orlikowski and Gash saw frames as stored in a web of meanings. Fridenberg and Silverman described frames as "...a place to store attributes or properties, if the concept and action can be applied to the concept."[see section 4.3]. Minsky on his side viewed the top-levels of frames as fixed, representing what's always true.[see section 4.3] With this interpretation frames become dependent of familiar situations in order to function. This interpretation is inadequate as soon as the subject enters a situation that does not match with his frames. It does not take into account that different subjects may perceive the same situation differently. The interpretation of frames as a sense-making tool [Orlikowski and Gash, 1994] limits its use when frames

are fixed. Our modern society is constantly changing, and we adapt to the changes we see. We learn how to operate new devises, make sense of a situation based on previous knowledge, and gain new understanding through experience. Looking upon technological frames as facilitators and resources is therefore more useful for the subject, and gives a closer interpretation of how they actually function, rather than Orlikowski and Gash's interpretation of frames as fixed. Looking upon frames as resources make them a lot more useful because they are flexible in content due to the given context. Technological frames as facilitators is also more helpful for the actor. A frame should not be limited to a given situation, as a resource it can be applied to any suitable context. All frames can be mixed and linked with other frames, and thereby adjust themselves to the given situation, and as new knowledge is gained. New knowledge can be stored in an existing frame, or it can construct a new frame. As frames are shifting in salience and degree of importance, its representation will also shift.

Sebastian used his frames as resources at task number three, of adding a third part into the conference with several participants. (see figure 6.4.) As he was to find a person that was not predefined in the contact list, and the name did not occur when he typed the name in the search area, he searched for the functionality under *more.* That was not of any help, and he tapped at the square next to the representation of the others. This would not have been possible if he was not able to use what the situation provided him with of possibilities. He mashed what the interface afforded together with his existing knowledge of what he could see as reasonable places that could hold that information. This example was not mentioned in the summary figure 6.4, as the process involved both usability, of what the system afforded, the designers frames of what was made possible, and Sebastian's ability to learn and understand a new interface. The interface did not inhabit that functionality for adding a participant, but it was an existing function for excluding a participant that was already a part of the conference. Magnus discovered the possibility Sebastian was searching for as one of the participants had to be dismissed from the conference due to troubles, and excluded only one participant in stead of ending the whole conference. When he tapped at the representation of a participant, the context card appeared, and he could exclude the participant from the conference. (see figure 6.5)

The interpretation of frames as resources is similar with Lucy Suchman's theory of Plans and Situated Actions. She conducted a study focusing on the relationship between observable actions and its processes, which in turn is not observable through action, but what makes an action meaningful. [Suchman, 1987] She was concerned about what constitutes purposeful action, and how it can be understood. Her study was of the use of a copy machine, built on a planning model of human behavior. The model treats a plan that is

Figure 6.4: Sebastian is using frames as a resource

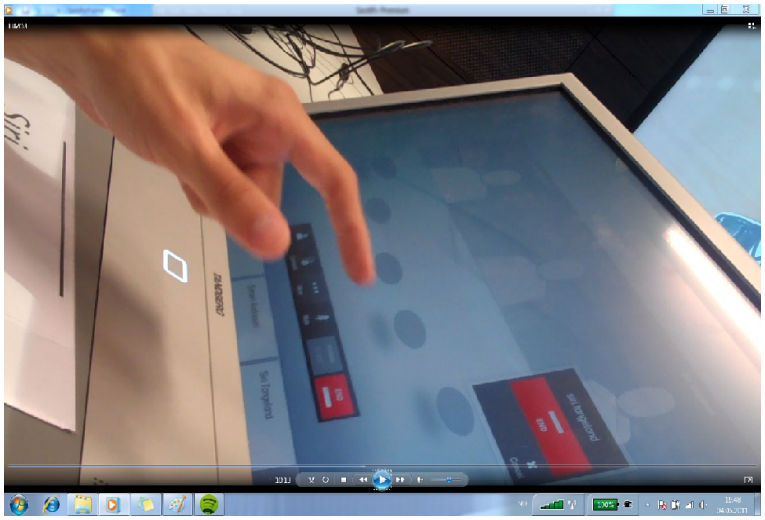


Figure 6.5: Magnus Context Card

within the human mind, which then again affects the behavior of the actor. Her interpretation is that this artifact functions more as a confusing element for the plans and situated actions, and thereby suggest a perspective of plans as formulations of original relationships. Suchman is concerned with when in action, plans should not determine the actual course of the given event, nor should it reconstruct it. What we should look at, is how an actor take use of what the accurate situation offers.[Suchman, 1987].

6.4 The elements of UF

With UF it is interesting to go back to the basic elements of frames, and look at how they function differently through an approach of frames as resources. In chapter five, knowledge, understanding, experience and expectation was emphasized as foundations for technological frames. Figure 6.6 and 6.7 function as a overview of the usability test, where you can see both the usability perspective, but also the perspective of where UF helps usability to get a richer understanding of the user. The collums are the terms emphasized in chapter 5, while the rows are examples from the usability test.

Due to→	Usability			Technological			Frames			
Issue			Knowledge	Expectation	Experience		Genre	Signs		Gestures
Start with several	-visibility						All: Not a part of			
Arrows	-simplicity -efficiency +affordance			Arrows lead to more info	All: arrows normally lead to more info			Communicate complexity		
Context card	-consistency -simplicity						Smart-Phone genre "add to"=genre for all			
Interface	-natural mapping -visual mapping -accessibility -consistency			2 "Wake up"button	Yes: touchinterfaces. Young &experienced group		Different genres among testers, Android/Apple	Shape as an iphone home button,2		Unpredicted moves within the interface
Mute	-visibility -natural mapping -Consistency						All a part of	1 does not understand the function		
Start/end (Global menu)	+affordance +efficiency			All: call/end	All: familiar signs		Western genre	Western sign		
Content icon Left:pc Right:doc.	consistency +affordance	-: Afford consist constr		Learned that pc is required for present→mind focused on pc	Experience with pc and presentation	numbers more important		PC: Familiar	Doc:Unknown or wrong context?	

Figure 6.6: Findings from the test 1.0

6.4.1 Knowledge

Frames based on knowledge can be gained through experience, but also through academic learning, where a subject possesses knowledge though hearing or reading. This was the case when Marie was able to understand content. She understood its meaning through the knowledge of the word, and she had the right attributes related to the term.

When looking upon frames as resources, awareness can function as knowledge. A process where awareness can function as knowledge, is when a person

Due to→	Usability	Technological Frames					
Issue		Knowledge	Expectation	Experience	Genre	Signs	Gestures
Content name	-simplicity	Language Marie	All: funct. for action, eg. present	Vga=ok	- genre of content=silo	Unfamiliar	
Keyboard	+affordance +natural mapping +efficiency +simplicity +&-accessibility +learnable +usefulness		1+Ø	Keyboard objects placed at known spots		Apple keyboard	Everyone gets it, 1 has extras
Search	+&-accessible +natural mapping +&-effectiveness +efficiency		Expects three char. Before name appear.	Similar experience google	All a part of the genre, 1 +lastnames	Known	all get it
Local presentation mode	-feedback -visibility		zoom→ -accessibility 1+exit function		drag n drop		Diff.gestures tested
Fullscreen presentation mode	-natural mapping -visibility			All:T3:Unable to use exp. from pc-presentation			Loads of gestures trested!
Feedback	-visibility -affordance -accessibility		Talks to mock-ups to get feedback	Lack of exp. made the testers expect more feedback			
Expectations		Pc content icon learnt by context	1,relocate pc		1;office reg. Contact Start/end More	Content unfamiliar	Move contacts T3, Zoom local present.T3
Gestures			to end full screen presentation mode	Applied experience to the interface	Multitouch, Apple, Android		

Figure 6.7: Findings from the test 1.1

uses internet, and the information found is used as a tool for finding further information. This process is only possible if you use your frames as resources and not as fixed frames to give you an answer. During the usability test, most of the participants used their awareness of gestures in order to try to end the presentation mode. They started by testing the ones they normally use, and then applied several other functions they had seen in use before at other objects, but were not certain that would function in a new context.

Within UF, acquaintance is useful when a person is able to give meaning and gain understanding of a new system based on acquaintance to similar systems or technical solutions. This way, acquaintance has similarities to familiarity. You know something about a similar technology, and you are able to make use of that knowledge to understand a new artifact. In the matter of technological frames and this study, an example of this is how the test-persons who, in advance, had knowledge of how to operate a touch device, used their knowledge of gestures to make T3 and Ocean function. The designers revealed that they sought inspiration from similar technologies (see

section 4.2.1.). These inspiration sources are seen as more valuable and valid if one looks upon them as resources instead of seeing them as new guidelines. When inspiration is seen as a resource, I argue that one is able to gain new knowledge of not only what is possible, but also to adjust what you find as interesting or inspiring to how you can make use of it for the accurate situation, and do that through or in a combination with existing the knowledge you possess. When we discussed sources of inspiration for Ocean and T3 (in the interviews), Windows 2019 was brought up. This is not something that exist per se, but is a visionary video for how Microsoft see the future interface and possibilities with computers. (It is possible to see the video at YouTube.com, or through this link: http://www.youtube.com/watch?v=qCyzRs03rs8) Using Microsoft's visions as a resource, the designers were able to create ideas for things they could implement in their design.

6.4.2 Experience

Experience can be viewed not only as acquaintance with similar technology, but also as a certain background that has given a person training about how to approach a new situation, eg. how a person is raised to think or approach situations, or background through experience. This interpretation of the term is mainly important for my perception of frames as resources, as I will argue that you can train yourself into being (more) flexible when choosing among the frames appropriate for the current context. If you are trained to look at a situation with different perspectives, you are able to vary which frames you use or combine in order to give meaning to a situation, or know how to behave in the given situation. Within my interpretation of technological frames, a frame does not have to be related to a certain situation, but it can be applied in several different contexts. This sort of training is from the routines mentioned above. How one looks upon experience through training as a part of technological frames, depends on the aim of the training session.

6.4.3 Expectation

In the section of expectation in chapter five, I used an example of how people is unable to re-frame in an unanticipated situation. Evolving this situation further, but with a perspective that frames can be seen as resources, it is interesting to study how the actor reacts: Whether he is confused because the situation does not follow its protocol, and is therefore unable to answer, or if the person is able to use his experience and knowledge to gain control of the situation in a delicate way. Lucy Suchman's example of how people were unable to use the copy machine when the plan diverged from the machine's plan, can be seen as similar to my conversation example. An actor who is

confused and unable to give a good answer and steer the conversation back on track, is similar to the actor who is unable to use what the situation in the copy room has to offer in order to get the wanted copy. Minsky talked of frames as expectations (see section 4.2), and also stressed how a person needs to re-frame, when the expectations are not met. When looking at frames through UF, expectations can have both facilitating and constraining effects.

Looking back at the usability test, there were several situations where the testers applied their frames of expectations, and then re-framed, using experience to find new solutions. The expectation of sorting people by their last names limited Astrid. When Astrid was unable to find persons through searching at their last name, she turned over, and tried to search by their first name. If she was controlled by a fixed frame stating that office supplies should be organized by last name, she would not have been able to apply her knowledge of the possibility of listing people by their firstname.

Expectation of gestures

The section of ending a full screen presentation at T3 exposed how the testers first applied their existing frames, then used their knowledge of similar technologies as a facilitator for trying out new opportunities, before they had to use the one function that they did not expect to use in order to get out of the presentation mode. At the search area, Magnus was able to let his irritation be a facilitator, and suggested that the search area should be cleared until the next time he were to use it, so that he did not have to delete each letter himself.

Expectation of functionalities

Sebastian exposed an expectation of exitbuttons when he was in the local presentation mode. His expectations were due to his experience with computers and iphone, and he was frustrated when not knowing which method was being used at T3.

> "I miss a function for closing windows. To press on the outside of the border in order to get back is a bit strange, cause I'm questioning what that actually happens. Does it close it, does it hide it, what happens? "
>
> Sebastian

He explained that in a browser window, there is always an exit or close function, but that you don't close a window if you move to another window or

fan. When using his iphone, he had a perception of ending a program if he left it. He further described that because this was a system, and not a webinterface, he expected an exit-function, to give him feedback that he was ending the program, and not letting it run in the back. At Ocean and T3, there is a end functionality from the global menu. When entering a program the icon goes from white to blue, indicating that the given functionality is running. It can be argued that nor Sebastian, or any of the other participants, noticed this due to lack of visibility such as too small contrast in the change of the colors. It is important to notice that Sebastian expected to find this functionality within the presentation mode, and not through the button he pressed to enter the functionality. This can indicate that no matter the change of color at the global menu, he will not perceive it, as he is expecting the given functionality within the interface, most probably at the top right corner.

6.4.4 Understanding

Understanding was not brought into the scheme, as it is a process that occurs based on each segment of technological frames. Expectations, experience and knowledge have influence on how the understanding is shaped, as well as genres, signs and gestures which will be discussed later. Using frames as resources, knowledge of, or familiarity with a feature/artifact can give you understanding of a new device, or understanding can generate knowledge and create a new frame. Understanding as discernment is not an obvious part of technological frames, but as technological frames are individually shaped, the discernment will be influenced by a person's existing frames. Understanding as tolerance is only valuable within technological frames if it is looked upon as resources. Tolerance can be valuable when reframing, or trying to reframe, as the subject has to set the existing frames on test. Tolerance as a human factor can be linked with my interpretation of experience through training, where tolerance and the ability to be open-minded help an actor to vary among his/ hers frames. These are valuable factors when learning, and the ability to learn a system as intended by the designers. In the usability test we saw that the testers did not perceive the content icon unless it was a computer. This can be due to what the situation presented and learned them, as they were searching for something that had similarities with what they recently had used, a computer. This way the understanding is shaped by the the context, and the experience the user has gained.

The conflict between the testers and the designers of perceiving *content* as a placeholder got me interested in whether it was possible to find something that could explain why the testers did not perceive content's function, and why the designers were rigid about moving it the first time they were presented with the findings from the test. For the designers, the term was

natural, and they had difficulties understanding why the testers did not perceive it. In the same way I was curious of why Christian had a total different perception from the other testers of the mute-function as beer glass. The case of content, it can be understood as a lack of a shared frame, while it in the case of the mute-button can be understood as a shared frame among most of the testers, except Christian. The fact that the term content seemed to be such a natural part of the designers language, indicated that it had to be something more. I turned to genre to find an explanation of the use of language and symbols as representations for a *social group*'s practices, and how different people in between different social groups can share an understanding, without it being a convention. Genre is a concept that describe the communication that take place within a *social group*[Orlikowski and Gash, 1994], and can be used as a tool to recognize the activities within a social group, but also to understand the communication within and between groups.

6.5 Genre

> Genres is a mechanisms of communication within different activities or social relations.
>
> Ridderstrom [2011].

The word has its origin from French as a description of species, sort, kind or genre. DictionaryReference [2011]. The origin of genre comes from the Latin "genus" which means category or class. Ridderstrom [2011]. Askehave et. al [2005] states that genres are best conceptualized as purposeful activities, with intentions of shared communicative purposes. Ridderstrøm defines genres as a social established way of communicating, as a help of how to act when entering or acting in certain activities. They contribute as mechanisms of recognition and understanding, and also function as a tacit convention or contract between eg. a writer and his reader. As genres is governed by norms and conventions, genres can serve as a method for examining how frames are created and gathered in different social settings by one or several social group(s). This is also confirmed by Ridderstrøm, who sees genres as a result of social interaction, and adds that they can limit the context. Yates and Orlikowski [2005] also stress this, as they state that ... "genres shape beliefs and actions, and in doing so enable and constrain organizational members engage in communication." [Yates and Orlikowski, 2005].

Genres are suitable for UF as they are governed by conventions and rules, which are not fixed, and does not have to follow a set of fixed moves, but rather through a common repertoire of moves. [Askehave and Nielsen, 2005,

123]

> Typical genres of communication in organizations include memos, letters, meeting, expense forms and reports. ... Through enactment, genres become institutionalized templates that shape members' communicative actions.
>
> Yates and Orlikowski [2005]

Most genre theorist tend to focus at speech or print when discussing genres. [Askehave and Nielsen, 2005] As Yates et.al states above, genres become institutionalized. As I moved away from the organizational scope with technological frames, I will move away from it when discussing genres. Acting with technology have been discussed and established a genre of itself, and goes under the term digital genres. Askehave and Nielsen [2005] stated that internet should be looked upon as a medium with a number of characteristics that in turn influence and contribute to the way web-mediated genres look and are used. Finnemann [1999] argued that when talking of digital genres, the user does not only read what he sees, he also looks for what the system provides, what options he has and the present purposes. This is interesting, as it gathers genres and usability through eg. how a user perceives that the system afford a function. Through the usability test conducted, it was obvious that the testers and designers shared a frame of perceiving the buttons at the global menu as pressable. It was never a question of wether the illustration of the global menu was buttons, the technology afforded thereby pressing,and as all testers perceived this, it can be seen as a mix of affordance from the system and a genre of touch-technology knowledge among the designers and testers. When examining the interaction between humans and technology, the concept of genre is fruitful to use. Within the technology the use of icons and words for descriptions can reveal the designers genre, and thereby also their social phenomenon(s). Genre can link technological frames to usability by using the interface as a representation of the designers frames and genres, which through a usability test can reveal which genres are shared between the test-group and the designers, but it is also a tool to reveal the frames they do not share. Using the argue of genres as institutionalized, it is valid to state that the design-group's genre(s) can be found in the interface of T3 and Ocean, in the same way as I argued that the designers frames were visible in the interface. As mentioned in the introduction, content as a placeholder for presentations can be seen as a genre within the social group of the designers.

6.5.1 Genres of gestures

"Genres are how things get done, when language is used to accomplish them." [Askehave and Nielsen, 2005, p.121], while Yates et. al. (1999), defined genres as socially recognized types of communicative actions. [Askehave and Nielsen, 2005]. I believe Yates and Orlikowski [2005] had a more appropriate definition, and I will say that language does not only have to be written or spoken, language in modern technology is also gestures. The argue is supported by Kress, cited in Alfonso [2011] who propose that it is necessary to move from a theory that accounts for language alone to "a theory that can account equally well for gesture, speech, image, writing, 3D object, color, music and others". In the usability test I saw that the test-persons revealed genres of gestures, as they were trying to operate the interface. This was not something I was aware of in advance, but as the test evolved, I saw how they tried to use the gestures they had learned from their cell/ smart phones. The gestures they had learned from their cell phones had become frames, and T3 and Ocean as being a similar device, made them apply their frames as resources when making use of Ocean and T3. The test-persons had different gestures, which revealed what cell phone they owned, as the different gestures of achieving a goal has different gestures among the variety of smart phones. The gestures in a smart phone can therefore be said to be a genre. A situation where this occurred, was when Sebastian were in a local presentation mode in T3. Sebastian played with drag n' drop methods in the interface, switching between the document camera and the presentation mode. (In the figure 6.8, you can see how he uses two fingers to drag each element into the presentation window in local presentation mode. To the left in the figure it is possible to see how the icon is about change size, due to its location close to the presentation window.) When I asked Sebastian why he chose a drag n' drop method when switching between the different presentation modes, he did not know at first, and said he probably had done that several times during the test. When that was dismissed as an option, he began to think more of it, and said:

> " I try what that seems easiest. I use drag n' drop on my pc. When I am moving elements. I grab the item and pulls it into the box where I want it. It is actually similar to when I am cleaning up on my iPhone. You know, when a game is placed in the gamingbox."
>
> Sebastian

He here reveals how he has a frame on how to move elements from both the computer and his iphone, and that the way he was used to do it occurred, as the easiest, and simplest way to achieve his goal. I told him that most of

the other contestants had clicked on it, and asked at the same time why he did not choose that as an option. Here is his reply;

> "Click isn't intuitive. It doesn't give any meaning. It isn't a specific action, unless the item is to to be opened."
>
> Sebastian

Apparently he links to different frames than most of the other participants who chose to click on the element they wanted to be in center. It may be that they perceived the "buttons" to be opened and not to be brought in to the right section before opening them, or they may have used other frames in order to make use of the interface. Sebastian works daily as a system developer, and may thereforee have another understanding of how elements need to be opened in their right file. Marie, and most of the other testers

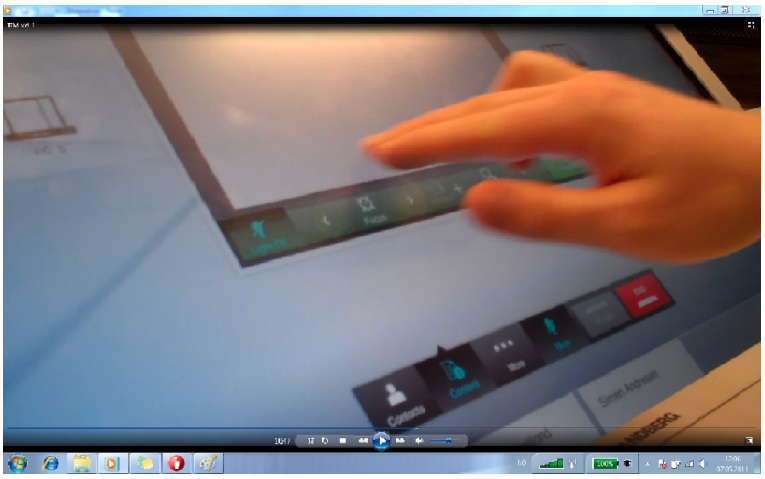


Figure 6.8: Sebastian using drag n' drop

tapped twice at the functionality they sought, and were frustrated when the elements moved. Marie is an Android user, and it became evident that her experience did not expect the elements to move and change size.

An example of a genre is the start and end function at the interface. The symbols were gathered from a genre that serves as a convention in our society, that green and red symbolize when to begin or quit, terminate or exit something. Within the context of phoning, it is to set up or terminate a phonecall, while in the genre of traffic rules it is whether to start or stop the car. As the designers were concerned about moving away from the phone-paradigm, the chose start instead of call, as way of creating their own genre, but kept the colors in order to underline and keep the implicit conventions

from the general genre of calling an action to begin or end.

In both the context card and at the keyboard, there is an add function. It was not payed much attention to, as the testers used it without any trouble. Looking at the material through the lenses of genres, *add* is a part of the genre that embrace technology in general. It was obvious that both the designers and the testers knew it well, as much as I as a researcher who were not able to recognize it due to its natural appearance.

Both the examples of the contact and the keyboard exposed the symbols used along with the text as clear conventions. I will say that these frames have become genres, as through their icon and text they represent what you can achieve through using them. If you see friends in the street, the normal way of approaching them is by using your voice and call their names, while with technology we have established a system for communicating when we want contact. This way of communicating is sorted in a list, much similar to the paper form of a phonebook. The digital phonebook is symbolized through different symbols associated with the purpose we are seeking. Cisco has created their own genre by using an icon of a person's silhouette. By doing so they find themselves within a genre, where they use the name contact, which is a strong convention internalized over time in our culture, and adding a personal touch to it / their own genre, by applying an icon that gives the user the right association. As we saw with the keyboard and how easily Sebastian got irritated due to a change in the representation of the keys, creating your own genre can be a challenge, and some frames best be left as Orlikowski and Gash's guidelines, instead of resources.

6.6 Signs

The aim of writing about signs is not to cover the field of semiotic knowledge. It is meant as a indicator of a term that I see as important for the level of success for usability, and an important segment of understanding the shaping of frames. Just as any other parts of technological frames are shaped by their context(s) and genre(s), words and symbols are affected by it as well. Just as frames are affected by genres, a genre is affected by its member's previous and secondary genres, and the language used within those genres. Our genres affect how we perceive language and symbols, but language and symbols also affect the genres we are within. Usability as a research area depend on the users' understanding of the words applied in a given interface, and technological frames depend on a shared understanding of language and symbols in order to communicate the wanted frames. Orlikowski and Gash did not include signs in their interpretation of technological frames, while I

will underline its importance.

The task of adding a presentation and the use of the button content, exposed a lack of shared frames among the designers and testers.It became evident that there was a lack of a shared genre dealing with the term, the icon was also a source of confusion.

The theory of signs is the semiotic communication. [Gillespie and Toynbee, 2006]. According to Saussure (1857-1913), semiology is the material signifier and the immaterial signified.[Gillespie and Toynbee, 2006]. The signifier can be dots, lines, shapes, sound waves or another physical concrete entity, which we link to, or associate with some idea or notion. The signifier is established as codes, which change as we learn and enter new situations. They are to be seen as conventions rather than laws, as they are adoptable and changable. Gillespie and Toynbee [2006] argue that when we leave photographic images, and turn to iconic images, such as the representation of a male and a female sign at a public bath, it becomes even clearer that visual signs are based on codes, just as much as language. The icons of the male and the female does not look very much like normal persons, but due to conventions, we recognize them as intended. They further argue that the relation between signifier and signifieds in signs can be more or less conventional, and that the signifier and the signified correspond with each other, intentional or accidental.

The icons at Ocean and T3 were iconic. The icon used for contact (see fig 4.2) was an icon familiar for most of the testers, and can be seen as a conventional icon, witch was perceived just as indented to. The computer icon at Ocean was also easily perceived. Ida explained that the icon was chosen due to its similarity or equality to the computer icon that Apple uses. The icon itself was not recognized by the testers, but in overall, they believed that the interface had similarities to Apple products, among others. Though stating this, they confirmed the designers intention of being associated with Apple through their use of icons. In chapter 4, I spoke of how the designers wanted, and believed that the interface stated quality and money. With that in mind, and the choice of an apple icon, indicates that within their community, Apple products are seen as exclusive and that they state quality. This is probably a notion that many people around the world share, and it can be seen as an established genre among the designers at Cisco, achieved from the outer world. By applying an apple icon into Cisco's interface, they added attributes that Apple's products already had, into their own interface.

Gillespie and Toynbee [2006] argue that when we approach a new item, or an image where both text and image is combined, we do not recognize what we see first, and how we combine the image and the word with each other and

thereby give them a meaning. They argue that it is only of analytic value, and that we in reality perceive both meanings more or less simultaneously. Signs can amplify meaning to language, or give more information than the text. The argue that we perceive both meanings of the sign and the word simultaneously, is in contrast to what the designers at Cisco believed. They saw language as prior and symbols as secondary. Both Jens, Kristin, and Hans agreed on symbols as secondary, and that their main function was to help the actor remember through recalling the symbols instead of the words used. At the test, I found contradicting results, where the testers used the symbols to gain understanding for the function available, and that they connected the image to the written specification, to amplify its meaning. It is possible to see Jens, Kristin and Hans interpretation of icons as secondary as a genre within the designgroup, but at the interview, Ida disagreed to the statement, and argued that the combination of text and image is superior in contrast to a text alone. The genre can therefore not be stated as internalized within the designgroup, but it is notably that both Jens, Kristin and Hans have the same education, and the genre can be linked to their background.

Gillespie and Toynbee [2006] write of Saussure's semiology where language was created to explain the semiotics, but has evolved into different genres. Saussure argued that language can be treated as a sign system. He stated that words gain their meaning from their relationship and difference from each other, rather by an intrinsic relationship to the thing for which they are a sign. Gillespie and Toynbee [2006] To put it in other words, language is shaped and distinguished by difference of other. In the same matter, Saussure argued that signs are also distinguished by its relation to other signs, and that the meaning given to the sign in particular, would not be a fact if it was not in contrast or compared to other signs. Peirce on the other hand, has an other approach to semiotics, where he sees everything as a sign. He reasons that everything means something to us, as we will link the new object to something that we already know, and in that matter, when we link it together with existing knowledge and experience, it will be embedded in our existing frames." In other words, Peirce's semiotic is a theory of perception and a theory of knowledge, as much as it is a theory of communication" [Gillespie and Toynbee, 2006]. This idea, which gives all signs different meaning, depending on the individual who perceives it, imply that it is impossible to determine the final and absolute meaning of signs.

Pierce's perspective has an individualistic approach. Applying the perspective into the concept of UF, it adds up with the interpretation of frames as dynamic and shifting, but it neglects the fact that we are part of a social group with some given borders, or genres that we communicate within. Having said that, signs as impossible to determine fits with the statement that genres are shifting along with the individual members within.

Saussures interpretation of signs is more static, but has a more "group-oriented" view of how we give meaning to signs. He states that through immersion in culture, humans have come to have a sophisticated understanding of signs, whether in language, music or visual images. This cultural knowledge takes the form of sets of codes or rules, according to the particular signifiers. The singnifieds are to some extent culturally determined, and arbitrarily organized. Thinking of how we understand technology, and due to the argue that frames are shaped based on inherent knowledge and experience combined with the genre and situation we find ourselves within, Saussure's interpretation is also valid for the interpretation of how we create new frames within UF.

The approach of semiotic understanding that constantly change as we develop, match with UF, as frames are seen as resources, flexible and dynamic in content, depending on context and genre. The notion that a signifier can mean different things for different people at different times and locations (Gillespie and Toynbee [2006]), underlines my argue of why Usability is not a covering field when one tries to understand why something went wrong and why the user did not perceive the same meaning of a feature or an artifact as the designer did. The icon of a document at the content button at T3 was difficult for the testers to perceive, they struggled identifying it, while the icon was seen as obvious for the designers.

6.6.1 Conflicting genres within the design group

Where the designers saw no explicit support of learning in the interface, they kept coming back to the term call to action and unintended actions. With unintended actions they thought the user should feel control over the actions of the systems, as nothing should occur, unless the user has permitted it. Call to action deals with that the labels of the functions should represent the activity the user wants to perform. I will argue that the terms were genres within the designgroup, created as a norm or philosophy which they all worked after. Both of the genres include the learning perspective, but in different ways. While unintended actions focus on how a user is able to operate and test the system without feeling insecure, the interface allows the user to learn-by-doing. Through a notion about labels that calls to action they focus on how a user is able to learn or understand the functionality behind the name. Both of these genres depend on that the user and the designer share the same understanding of signs.

The designers at Cisco had an understanding of content as a silo, an understanding the testers did not share. The testers did not grasp the attributes

Figure 6.9: telenor.no

attached to the word, as they were not within the same communicative genre as the designers. The designers wanted content to be perceived as a cloud that contains what you would prefer it to contain, that is shifting after who uses the system. Kristin spoke of content as a placeholder/term that in time would consist of everything it is needed for. She also stressed that it is an academic term, that may not be that natural for people who don't have English as their native language. The metaphor of one place as a placeholder for all functions (vs. the need of a rich, elaborated menu), is an emerging frame among the developers and interaction-designers at Cisco, and it has been a hot topic this winter among the interaction design environment in Oslo.(see eg. [Dalen, 2011],and [Halland, 2011]) A newly redesigned webpage has taken the metaphor in use, presenting navigation menu through one entering button, instead of many visual navigation spots. Telenor's new webpages for private persons is an example of this, see 6.9 As the results of the tests were presented the designers, both from my test and the old group, it became more evident for the designers that their interpretation of the silos were not comprehended by the testers. As the testers were told to present a presentation, many of the test-persons looked for a place that had the same name as the action they wanted to perform, in this case presenting. Due to this finding, the designers at Cisco has changed the name to presentation, a term that was more familiar for the users, and appropriate within the test-persons mind-set of when a process is *called for action*.

At the same time as the designers spoke about how the interface had to call-to- action, they did not perceive that is was conflicting with their silo-genre. Looking at the whole global menu, and excluding start and end, both contact, content and more can be seen as silos rather than buttons that calls-to action. With contact and more, this is not as easily perceived for neither the user or the designer, as both terms are established "silo-concepts". Though being established genres of where to find information, the signs in both name and icon, become symbols that calls to action when we are searching for information.

As the meaning we subscribe to words and icons depend on how we

identify ourselves, gestures should be looked upon the same way. Rogers et al. [2007] has not embedded touch technology in their understanding, but it is an emerging field that needs to be taken into consideration, and to be implemented in the understanding of technological frames. Along with the cognitive element of reading, speaking and listening, I will argue that it should be taken in considerations and be implemented, as it is a way of learning and constructing meaning in the same matter as we do with reading when approaching new technology.

6.7 Intertwining and remodeling UF

In the process of unpacking the elements of technological frames, genres and signs have been included to the concept, in order to answer what affects the shaping process of frames. Through the results from the usability test, it became evident that signs and genres are interlocked processes, as the sign is given meaning and purpose through the genre the actor defines himself within. Genres are also a part of signs, as a collection of signs indicates a genre. Genres are shaped due to experience, and experience is interpretated within the genre the actor perceive himself within. The usability test showed that gestures had an impact of the level of success with the tasks. Whenever a gesture is needed, it can be seen as a sign, as the gestures taken in use are dependent on the knowledge the actor has of the technology at hand, and previous experience with similar technology. The gestures expose witch genres the user has. This was seen in the test where Emil, Marie and Astrid tapped twice at the interface to end the presentation at T3, while Sebastian, Magnus and Hedda only tapped once. What Emil, Marie and Astrid exposed were Android gestures, where you tap twice to enter or exit eg. a photo or application, while this is not a common gesture within Apple's iPhone interface which Sebastian, Hedda and Magnus shared. Both Android and iPhone share many of the same gestures, but if the designers do not take different gestures in consideration, the gestures allowed in a interface can determine what user-group the device is designed for. This can be used both as a method of symbolizing what the interface identifies itself with (and not only through the material used), but also to exclude or include different users.

In the definition of technological frames, Orlikowski and Gash "...propose a systematic approach for examining the underlying assumptions, expectations, and knowledge that people have about technology." [Orlikowski and Gash, 1994, p.174]. While looking at the results from the usability test in the eyes of technological frames, it has become clear that experience and knowledge are highly intertwined. Knowledge can be gained through experience,

but it can also be shaped through learning about an object or situation. There where few situations at the usability test were knowledge was taken in use without being applied experience, but Marie understood that *content* had to be the right place to find the presentation. She explained it through her knowledge of the language, and not through experience of content as a placeholder. As the case with Marie was a single case, experience and knowledge have been gathered into the same group of UF, but knowledge gained through learning without experience is included. The test also showed that experience does not have to be applied as expectations, experience can be a tool to test out existing knowledge without being used as expectations. When Sebastian applied his drag n' drop method with the presentation, he used implicit experience to operate the presentation mode in T3. In the discussion of why he chose that given method, he exposed that it was not a function he expected to be there, but it was a function he normally used when operating both his iPhone and moving elements at his computer, and that the knowledge of its possibility made him apply the gesture.

Expectations are the effect of experience. Experience shape the subjects expectations of how to act in a certain situation or what to expect from an object. The usability test exemplified that knowledge shapes the expectations refering to what we know and think should be a part of something. The case with the arrows demonstrated that the testers had expected more information when pressing the arrows. That was an expectation gained through experience. It revealed that the expectations were so strong, that the testers did not notice the action at the participant bar. (This could, however, as stated in the usability chapter, be due to visibility).

Understanding is connected to genre, and functions as an intersection between genre and experience, and includes the learning process(es). It is because understanding is a combination of those elements, that they both affect each other. The understanding a person has of a device or situation will affect the learning process through the judgement and decision making of the actor.

Within UF, a frame contains expectations and genres that allows the user to rapidly comprehend how a new technological device should be operated. This is dependent of basic cognitive abilities, such as reading, speaking, listening, and memory, perception and problem solving. A user is able to re-frame, and create meaning when something is not as predicted through existing knowledge, experience and understanding. We learn in the light of our previous frames, depending on the context and situation we are in. We will always be affected by the current context, and also through the genres that we identify our self with, and have identified us with in the past. Linking this to what we learn, and how we understand the the world, I will

use Peirce interpretation that everything is a sign, and that we gain understanding of it through the genres we are within along with its context. It is important to emphasize that all frames and each segment within UF is dynamic in structure and content. An example of how frames should be looked upon as shifting, is the argue for including gestures into the concept of frames, as touch technology is an emerging field within the everyday life technology, and is used as a way of gaining understanding, but also as a sign to specify certain attributes.

6.8 Introducing a UF tool

USABILITY	UNDERSTANDING FRAMES			
	Experience & Knowledge	Expectations	Genre, signs	Gestures
Natural Mapping				
Affordance				
Consistency				
Constraints				
Feedback				
Usefulness				
Efficiency				
Effectiveness				
Learnability				
Satisfaction				
Accessability				
Simplicity				

Figure 6.10: Understanding frames

Figure 7.2 is a tool created for UF. It is an extension from the mind-

set of UF, its purpose is to function as a tool for the designer or researcher when in the process of identifying the user-groups frames, to be used present- and post a usability test. The column represent the elements of UF, where knowledge and experience are categorized together in one column, while expectation has got its own column. Genres and signs are gathered in the third column, while gestures has gotten a separate column. As previously stated, gestures is a part of genres, but has got its own category because of two things; the first is due to its importance for touch interfaces, and that the action can be easier to draw than to write. If drawing is used, it will take up space, which was needed for describing a genre. The second reason why gestures has its own column is that all interfaces are not touch interfaces, and in those situations the column is easily removed. The rows are usability measures. These can be changed after what measurement that is the most valid for the system intrigued. The white cells are to fill out when a situation occurs at the test, and answers the reasons of why the usability measures failed or the system was used as intended. If the test operator does not know where to fill in the given situation, it is a signal of questions needed for fully comprehending the situation. There should be one scheme per test, and after all tests are run, the schemes should be compared, and the most important elements gathered in a new, summary scheme.

As proven when discussing technological frames and the designers inspiration sources, as well as when discussing the genres that the designers are within, they are, at the same level as the users, controlled by their frames and genres. In order to design what's good for the user, and not simply what's cool, scenarios are not sufficient for understanding the users perception. Through investigating the users UFs, a designer can learn about the users genres, and thereby create systems that are easily learnable and usable for the user. The schemes should therefore be filled out by the designers as well in advance of the test. After the test, the designers schemes are to be compared to the testers, in order to look for similarities and differences. This way, the designers visualize the different genres between the two groups, and are able to recognize the differences easier.

6.9 Next time...

There are many lessons learned from this analysis. I will start by looking at the practical aspects of the usability test, and then what I would apply at a next session of usability testing.

In retrospect, it became evident that during the usability test there were several situation that should have been more thoroughly inquired. Even

though I had an aim of conducting an unstructured interview throughout the test, there were occasions were I had to contact the testers to ask about situations I had not been able to ask enough about at the given time. I will therefore argue that when researching on HCI, it is preferable to set up a post-interview with all participants, as well as conducting an unstructured interview during the test. The situations were often small, so as long as the participants are ok with it, I will argue that a group interview or a focus group is favorable. To interview all at the same time can be time saving, and as one person tells about a situation, it can trigger the other participants to share they thoughts or trigger their frames to be more explicit.[Brooks and Quesenbery, 2010]. The post-test interview should be semi-structured, and the interviewee should be shown the video of the situation in scope. When I had to contact the testers post testing, it often took some time to refresh their mind about the given situation, while in those cases where I was able to show them the video, it was easier for both them and me to be sure that we were discussing the same situation.

The post-test schemas were meant to function as a session of reflection for the testers, but this did not happen. The testers mostly wrote the same as they did during the test, and the schemas were of little use for me. This can be due to the questions asked, but it can also be due to that the testers were not able to reflect that much upon the test, so shortly after the experience. These kind of schemas can be neglected next time, a post-interview is more fruitful. For the test, I had printed out the tasks that the tester would go through, and with space for notes. I had one for each participant. They were frequently used for the first tests, but when looking through the material, it became evident that while I was noting, I missed out important sessions. In order to spend less time noting, and more time focusing on the tester, I made small bullet points for the last test-round, where I could circle out what happened as the situation I predicted occurred, and create small notes when needed. These were not used when creating the summary report, due to the fact that the previous report was a video presented the designers. The video created on request of the designers, as they wanted tangible evidence. Based on this experience, I would argue that it is more important to spend time after each test to reflect upon what was important, instead of letting the testers summarize their impressions. These notes can function as a memory list when creating a report, either in video or written format. Toftøy-Andersen and Wold [2011] argued that when setting up test-session, the best way is to spend 45 minutes at each, two in a row before lunch break. It is better to take one at a time, in order to calm down after a test, and write a summary. By only being one test moderator, it did not take many unforseen actions to affect the outcome of the test. The actions were never of much concern separately, but elements such as participants who phoned to say they were late, or that they needed the directions once more was enough

to affect my concentration about the test in focus.

Toftøy-Andersen and Wold [2011] also argued that the researcher should know what to look for in advance of the test. After creating this analysis, I will emphasize this argues value, but I will also argue that as a researcher, it is important to keep an open mind, and let the tester explore the interface. It can reveal frames that the usability requirements other than those you had in mind. Task number three of adding a person that was not pre-set in the contact list was one of those situations that turned out to reveal several frames, genres and reasoning mechanisms, while the original goal of the task, was proven not that important. It was due to that knowledge that the scheme created for UF was left with open white spaces, instead of letting each task have their own row. This way, any situation that occur can be noted, linking it to its right reasons, without messing the scheme.

I learnt that instead of giving the testers a schema to fill out post testing, it is more valuable to have one of your own, where it is possible to note important elements along with its corresponding usability measurement and where it comes from, if it is a genre, a sign, learnt knowledge or experienced. This can be done through the test, but as stated above, I will underline the significance of filling out the schema after the test is done.

When conducting research on HCI through a usability test, I will argue for that the model of UF, see figure **??**, is used as a mind-set when examining the process, while during the usability test, and when analyzing whether it is the subject or the object that possess a frame, one can use the schema presented in figure 7.2. The vertical rows should be filled in after the usability requirements for the test.

Chapter 7

Conclusion

My aim for this study was to look at how people are able to create and give meaning to a technological devise at hand. I was interested in which cognitive methods they applied in the process of understanding and purpose of a device. I was also interested in how technology represent its creators' frames, and how the device again affected the user. The first research question was:

- How can usability methods serve as a tool to detect both the users' and the designers' technological frames?

In order to investigate the research question, a case study was created. It was based on a usability test conducted at Cisco. I used the test in order to get a peak into 10 different peoples' frames and investigate how they made use of the devises at hand. In addition to this, I interviewed some of the designers in the design team at Cisco, where my aim was to learn more of why the interface had got its particular design, and also to investigate if there were any relation between the designers' and the testers' frames.

The question of usability has been seen as who's to blame when the system is not usable. Donald Norman underlined that it isn't the users' fault, it is the designers' who did not create a good enough design. I have had a different perspective, as I have been more focused on why a user find a system usable, and what reasons there are. As the test was ran, it became evident that the usability requirements functioned as a trigger for the testers frames. In the process of evaluating Ocean and T3s' success rate through usability methods, the methods functioned as a eye-opener for me as a researcher. Through the test, frames were exposed by the testers ease of use or frustration of some tasks, some more obvious than others. The placement of end presentation in fullscreen mode at T3 suffered from a lack of consistency and natural mapping in the interface, but it did not answer the questions of why it was perceived as the wrong button to choose beyond its placement. The questions that arose from the level of success from the usability requirements,

lead me to Orlikowski and Gash's concept of Technological Frames. In order to pin out which frames that caused obviousness or frustration, I relied on the interviews conducted throughout the test. In retro perspective, I found these as equally important as the usability measurements for understanding which frames had been used in the sense making process. The usability test also exposed frames, important for the sense making process of the tester, but that did not fall in under the requirements of the test. The situation where two of the testers tried to "wake up " Ocean through the use of the last call button revealed a genre from iPhone. The genre found implied that the testers expected further functionalities in Ocean and T3, equally to functionalities available in their iPhone. One of them exposed the same genre when he applied a drag n drop method when adding a presentation at T3.

The following research question was:

- How can technological frames be used as an analytic tool for investigating the use and design of Cisco's telepresence system Ocean and T3?

The concept of technological frames was applied as an analytic tool to investigate how it could support and give answers to the results from the usability chapter. It revealed the affect the designers frames had of the outcome of the interface, eg. through their inspiration sources. The search area revealed a strong frame of expectations, where many of the testers expected a name to appear after typing three characters. When this did not occur, they believed it was something wrong with the system, because it did not react the same way as they expected. The expectation was gained from experience with previous search functions provided by Google, wikipedia etc.

Technological Frames turned out to be a vague concept, trying to involve many research areas without being specific about its borders. It lead to a wide range of possible ways to understand the concept. In order to keep focus at tools for investigating how people assign meaning and use to a system, definitions and interpretations were chosen after its relevance. It lead to an argumentation of how frames should be viewed as resources, not strictly as guidelines, as it had constraining effects. Orlikowski and Gash's interpretations of frames as stored in a web of meanings, made the concept static and leaving the individual mental models out of scope, where frames as resources allowed the subject to take advantage of their frames in a fasilitating way when entering an unfamiliar device. UF was introduced as a term to gather my interpretation of frames. UF stands for Understanding Frames. Within UF, experience and expectations are two separate dimensions, where experience is the cause and expectations is the effect, compared to Orlikowski and Gash who saw this as equal terms. Technological frames were insufficient to examine the interaction between the subject and the technology at

hand, and genres, signs and gestures were brought into UF to explain how one can understand more of the use and shaping process of frames. How we understand and make use of our frames dependent on the genres we are within at the present time, both conscious and unconscious, and those we have identified us with in the past.

The findings from the usability test and the interviews exposed that both designers, technology and users inhabit a set of frames, and that they equally affected each other. The affection was dynamic as the user and designer used their frames in their learning process, and thereby changed the meaning they subscribed to a signs. The technology affected the meanings the user had, which then again affected the design process of a new artifact. Based on this, the model of UF was presented as a mind-set for understanding the dynamic intersection among technology, users and designers.

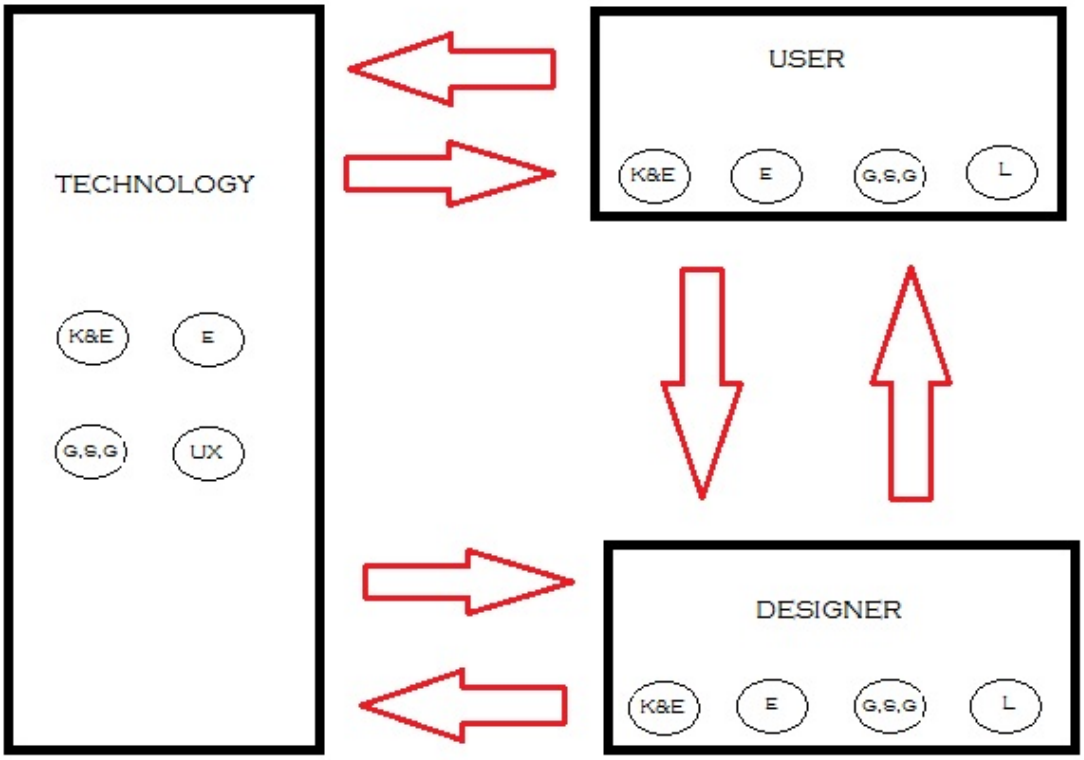


Figure 7.1: UF relationship between user, designer, technology

The model is a representation of wherever there is a lack of understanding the technological device, it may not be due to poor usability or dumb users, but due to a mismatch of frames between the designer and the user. UF

function as an adoptable and changeable mind-set, due to its surroundings, both context and content. It can be viewed as a collection of our genres, exposed through how we choose to operate a system. It is emphasized that frames are seen as resources that helps the user in learning to operate a new technological device.

Based on the results from the analysis I will conclude that it is valid to state that when examining a technological devise, technological frames and usability are intertwined, dependent on each other to cover the actual scope. Through applying the UF tool, the designer will get answers to the decisions made when acting with an object, answers usability does not provide.

USABILITY	UNDERSTANDING FRAMES			
	Experience & Knowledge	Expectations	Genre, signs	Gestures
Natural Mapping				
Affordance				
Consistency				
Constraints				
Feedback				
Usefulness				
Efficiency				
Effectiveness				
Learnability				
Satisfaction				
Accessability				
Simplicity				

Figure 7.2: Understanding frames

Usability has been a focus for several years, and I believe that within the design environment usability has become an established "truth", something most designers strive to achieve. UF can help the designers in changing the focus from who's fault it is when something isn't perceived as useful, into a focus of investigating and answering the reasons for why something is perceived as useful or not. I therefore think it is about time to change the focus from who's fault it is when something isn't useful, into looking at why something isn't perceived as useful. I will therefore conclude that through applying the mind-set of UF, and its following tool, it will help designers to increase their understanding of their users, which then again can lead to better design solutions.

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Appendices

Appendix A

Material from the usability test

The usability test and UF gathered, with the material from the test.

Figure A.2 is a remodeling of figure **??**. It is a three dimensional figure where experience and knowledge are categorized as one category, while expectations is left as a single factor. Genres contains signs and gestures, while usability has kept its attributes of usability principles from the first figure. This figure also contains the dimension of the designers frames, represented in the brown boxes.

Informasjonsskriv ang deltagelse i brukertest som skal benyttes i Trines Masteroppgave

Masteroppgaven min skrives ved Universitet i Oslo, institutt for informatikk. Det er de som har ansvaret for min oppgave, og på deres bibliotek oppgaven vil finnes i fremtiden.

Prosjektet er meldt inn til Personvernombudet for forskning, Norsk Samfunnsvitenskapelig Datatjeneste AS. Min veileder er Tone Bratteteig, førsteamanuensis ved Institutt for Informatikk, UIO. På Tandberg har jeg min bi-veileder, Torkel Mellingen.

Oppgaven omhandler hvordan technological frames, eller referanserammer på norsk, påvirker bruk og design av Tandbergs videokonferansesystem, henholdsvis T3 og EX90. Begrepet om referanserammer stammer fra den kognitive psykologien, og handler om hvordan brukere anvender eksisterende kunnskap om teknologi til å forstå ny teknologi som blir presentert for dem.

Formålet med testen du nå skal være med på er å teste systemenes brukervennlighet. Jeg ønsker og å forsøke og forstå hvordan du velger å utføre gitte oppgaver. Underveis vil jeg stille spørsmål rundt hva du tenker og få til en samtale om dine meninger om systemene. Etterpå vil du få utdelt ett skjema der jeg ønsker at du skal skrive litt om opplevelsen du nettopp hadde. I etterkant ønsker jeg å sammenligne dataene jeg får fra testene med materialet jeg får fra intervju med designerne.

Testen vil bli tatt opp på video. Videoene vil bli lagret på lukket område hos Tandberg. Når alle testene er ferdig vil jeg lage ett sammendrag i video og skriftlig form, som vil bli vist til designerne, slik at de kan jobbe videre med det, før oppgaven er over. De vil bruke videoene som en bekreftelse og tilbakemelding på hvordan dagens design fungerer. Disse tilbakemeldingene vil de bruke som inspirasjon ved neste designfase. De vil ikke bli vist til noen utenfor Tandberg, de er kun ment som ett verktøy for videre utvikling og forbedring av dagens produkt. Sammendragsfilmene vil anses som Tandbergs, og vil bli lagret i på deres område. Dette er ett passordbeskyttet område, men som alle designerne vil ha tilgang til. Sammendragsfilmene vil bli slettet når oppgaven er over i mai 2011. Råfilmene er det kun jeg som sitter på, og de vil bli slettet når oppgaven er innlevert i mai 2011. Videokameraet vil være rettet mot hendene dine, og stemmen din vil komme på opptak. Ditt ansikt vil aldri bli filmet, men ettersom jeg tar opp både stemme og hender kan jeg ikke garantere hundre prosent anonymitet på filmen. Ditt navn vil aldri bli publisert, verken for Tandberg eller i min innleverte oppgave. Det er kun jeg som vet identiteten til deltakerne på brukertestene. Videoene vil ikke ligge ved i oppgaven, og jeg garanterer full anonymitet i innlevert masteroppgave.

All deltagelse er frivillig, og du kan når som helst trekke deg fra testen, uten grunn.

Mitt navn er Trine Paulsrud, og kan nås på trine.paulsrud@gmail.com eller per tlf 99619682, dersom du i etterkant av testen ønsker å trekkes ut av oppgaven.

Figure A.1: Informasjons skriv ang. deltagelse intervju

Due to→	Usability		Technological		Frames	
Issue			Expectation	Experience (Knowledge included)	Genre (If split collums: Genre left, signs middle, gesture right)	
Start with several	-visibility		Testers Did not expect	Have no experience of it	Not a part of the testers genres	The designers aiming at creating a genre for this
Arrows	-simplicity -efficiency +affordance		Expect more info	Experience of further info	Communicate complexity for testers	+unintended actions forseen
Context card	-consistency -simplicity				Smart-Phone genre shared by both designers and testers	
Interface	-natural mapping -visual mapping -accessibility -consistency		Seb&Hedda "Wake up"button	Unknown frames from the designers for reasoning interface design	Different genres among testers Shape as an iphone home button	Unpredicted gestures within the interface
Mute	-visibility -natural mapping -Consistency			Known function for all testers &designers	Christian on the outside of the genre	Apple genre among designers
Start/end (Global menu)	+affordance +efficiency		Expectations post action	Familiar signs	Western genre, both designers and testers	
Content icon Left:pc Right:doc.	consistency +affordance	- Afford - consist - constr.	Doc: easily perceived	Experience with pc and presentation+ Learned that pc is required for present→ mind focused on pc	No experience,re frames and learnt in the session. Numbers more important, don't get icon	Familiar PC: Sign insufficient for designers	Unknown or wrong context for testers? Doc: a part of silo genre
Content name	-simplicity		Expects funct. for action, eg. present	-lack of experience Vga=ok=experience -Language	Testers Not within the genre of content=silo	
Keyboard	+affordance +natural mapping		Emil+Ø	Keyboard objects placed at known spots Seb. And space	Apple keyboard, similar to	All testers gets the gestures, Emil

Figure A.2: UF & UX 1. Brown boxes represent the designers frames

Due to→	Usability	Technological		Frames	
Issue		Expectation	Experience (Knowledge included)	Genre (If split collums: Genre left, signs middle, gesture right)	
	+efficiency +simplicity +&- accessibility +learnable +usefulness			computer keyboard	has extras
Search	+&-accessible +natural mapping +&- effectiveness +efficiency	Expects three char. Before name appear	Similar experience	All testers part of the genre, shared with designers	Every one understand how to apply the right gestures
Local presentation mode	-feedback -visibility	Hedda+zoom→ - accessibility		unfamiliar	Different gestures tested
Fullscreen presentation mode	-natural mapping -visibility		Lack of experience or Unable in T3 to use experience from pc-presentation?	Loads of gestures trested!	
				Different perception/genre what is natural mapping expressed with placement of end present. Button.	
Feedback	-visibility -affordance -accessibility	Testers expect more	Lack of experience made the testers expect more feedback		
Expectations		Hedda,relocate pc Astrid+names		Genre: Contact Start/ end more	Sign: Content unfamiliar	Gesture: Move contacts in T3, Magnus Zoom Hedda Seb vs the rest local present. T3
Gestures		Expect gestures =enough to end full screen presentation mode	Applied experience to the interface	Multitouch, Apple, Android, many shared by designers and testers	

Figure A.3: UF & UX 2. Brown boxes represent the designers frames

Appendix B

Material from the interviews

Revidert intervjuguide:

Bakgrunn
Utdannelse
Hvor mye har du tatt med deg fra utdannelsen inn i jobb her?
Aha-opplevelser?
Tandberg
Hvor lenge har du jobbet her?
Inspirasjon
Hvor søker du inspirasjon?
Hvordan deler dere inspirasjon mellom designerne?
Hva ligner ocean og T3 på? Hvor hentet de sin inspirasjon? Hva valgte dere bort, hva har dere trukket frem?
Er dere enige i materialvalg?
Hvorfor er pilene vekk fra contacts?
Avgjørelser og alignment
Kan du fortelle om samarbeidet mellom designerne?
Hvordan tas avgjørelser?
Er dere mye uenige og hvordan løser dere det i såfall?
Alignment:
Hvordan forklarer du hva som er viktig for nytt design for productmanagement? Hva må du trekke frem som viktig for å få gjennomslag? Kvantifiserbart og kvalitativestudier?

Ocean og T3
Hva tror du brukerne forventer før de ser systemene?
Hva tror du brukerne tenker når de ser systemet? Hvem har lyst til hva og hvorfor?
Hva ville du forventet av systemene for å være moderne? Hva gjør de moderne i dine øyne? Hvorfor?
Attention: Hva tror du brukeren ser først? Er det bevisst valg bak utseende for at det skal se slik ut? Hva har vært viktig å få frem og hvorfor?
Fortell om tanken bak utseende. Hva er prinsippene? Hvor kommer de fra?
Hvordan støtter systemene læring? Hvordan lærer brukerne seg systemene? Hva er det som gjør at de skal skjønne det med en gang?
Hva synes du at systemet stråler? Både av materiale og av grensesnitt. Hva gjør at de representerer det?
Content knapp:
Tanken bak?
Hvorfor navnet content?
Hva er bra ved navnet og hvordan galt valget dit?
Hva tror du brukeren tenker?
Max/minimize, hva var tanken da dere fjernet local view og byttet ut med minimize? Hva ønsket dere å oppnå?
Start knapp:
Hvorfor heter den start og ikke call?
Hva er tanken bak?
Hvorfor grønn og ikke gråtone?
Symboler:
Hvilken betydning tror du symbolene har for brukerne?
Hva tror du at de tenker når de ser content-symbolet? (dokument)

Figure B.1: Interview guide

Informasjonsskriv ang intervju til Trines Masteroppgave

Masteroppgaven min skrives ved Universitet i Oslo, institutt for informatikk. Det er de som har ansvaret for min oppgave, og på deres bibliotek oppgaven vil finnes i fremtiden.

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Formålet med dette intervjuet er å lære mer om hvordan du oppfatter brukergruppen du designer for, og om hvordan du opplever at T3 og Ocean har tatt høyde for sin brukergruppe i designprosessen. Jeg søker å forstå hvor dine referanserammer kommer fra, for å forstå hvordan du tenker rundt design.

Intervjuet vil bli tatt opp, og det er kun jeg som vil ha tilgang til materialet. Jeg vil oppbevare intervjuet i en låst mappe på min pc, og all data vil bli slettet når oppgaven er levert inn i mai 2011. Du vil bli anonymisert, og ditt navn vil aldri dukke opp i den innleverte oppgaven.

All deltagelse er frivillig, og du kan når som helst trekke deg fra testen, uten grunn.

Mitt navn er Trine Paulsrud, og kan nås på trine.paulsrud@gmail.com eller per tlf 99619682, dersom du i etterkant av testen ønsker å trekkes ut av oppgaven.

Figure B.2: Informasjons skriv ang. deltagelse intervju

Appendix C

Original quotes

C.1 Chapter three, The Usability test

C.1.1 task one

"Det var så lett som det kunne bli"

Martin about task one.

"Det logiske er å klikke på contacts ..."

Magnus talking about the first task at T3.

"Bare sånt dumt spørsmål, bruker man mail når man ringer? Det har jeg aldri vært borti før."

Astrid

C.1.2 Task two

"Det var litt vanskelig å forstå hvordan man skulle starte en videokonferanse med flere personer."

Siri

"Da klikker jeg her, og så får jeg vel opp flere valgmuligheter"

Emil

"Nå har de kommet ned der (p.bar), og da kan jeg ringe."

Sebastian

"Ettersom det ikke finnes noen pil som på Ocean, så er det ett enklere grensesnitt på sett og vis."

Magnus

C.1.3 Task three

"Bra ikoner, sier mer enn teksten"

Magnus

"Om det ikke hadde vært ett laptop symbol der, så forstår man kanskje ikke at det hadde vært en presentasjon."

Emil

"Der er det pc da, men jeg har lyst til å trykke på more."

Hedda

"Da tipper jeg det er på content her. ... Fordi det var der i stad, men nå er det ikke engang noe ikon av en pc en gang!"

Emil

C.1.4 Feedback

"Bare sånn dumt spørsmål, da så han meg, ikke sant?"

Astrid

"Det burde jo være bilde av meg, det er jo sånn når man chatter via webcam."

Astrid

"Jeg vet ikke om de andre ser dette nå. Kristian, ser du?"

Sebastian misses feedback

Jeg har ikke noen måte å se hva de andre ser på. ..så jeg er avhengig av muntlig feedback?"

Marie misses a way to see what the other contestants at the conference as looking at.

C.1.5 Gestures

"Arg, hva skjer nå? Hvorfor flytter de sånn på seg?"

Marie

C.2 Chapter four

C.2.1 4.2.1: Inspiration sources of Ocean and T3

"I touch har man noen konvensjoner, noen prinsipper som apple har definert, ettersom det er de som knakk koden først. De var de første som klarte å lage ett touchgrensesnitt som egentlig appelerte. Tidligere var det masse touch, men ingen som klarte å dra nytte av at det var touch, det var veldig lik tilnærming til sånn som det var med pc, mus interasksjon. Veldig sånn klikk,klikk,klikk. Utfordringen med touch da, er at man fjerner, det er at man liksom hopper over ett kort da, at man går fra ett skjermbilde til ett annet, der alle knappene er kuttet ut. ...En av de store frihetene med touch var en enorm frihet til å pøse på med knapper, plassere de ut. ...Det som jeg tror apple klarte, var at de var så kompromissløse på hva som skal tilgjengeliggjøres her, og bare ett minimum liksom, og prøvde å skrelle ned til kjernen. Men i tillegg bruke mediet på en slik måte at man skaper økt forståelse om hvor man kom fra og hvordan man kommer seg tilbake. Derfor er det en kobling mellom Appel, Ocean og T3. Andriod er jo sånn hirarkisk sett ganske likt som iPhone, selv om de har implementert flere desktoper og mer applikasjoner,... men i utgangspunktet er modellen veldig lik, særlig når man snakker om identitet og likheter. "

Henning

"...Gjerne hente inspirasjon fra noe som på ett eller annet nivå har ett felles trekk,... men som ikke er det samme."

Kristin

C.2.2 4.3.1: Start and End

"Oi, jeg var visst litt rask på den rød der. "

Martin

"Det at det står start der gjør meg litt usikker, siden jeg ikke vet hva annet systemet kan, men jeg velger å trykke allikevel. "

Sebastian

At man har en stor grønn knapp når man skal ringe gjør det tydeligere. Tydeligere kan det ikke bli. ... Det at det er en grønn kanpp der tror jeg egentlig at gjør det nesten likegyldig hva som står i knappen, på en måte. Utfra konteksten. "

Jens

C.2.3 4.5: Technological Frames within social groups

"...Det blir nesten som å lage personas. Det blir veldig abstrakt, det blir generisk, det kan hjelpe en til å være kreativ, det kan hjelpe en å se problemstillinger fra flere perspektiver, å sette seg inn i det man tror kan være brukernes problemstilling osv. Men det er jo ikke reelt. Det er jo skapt av en selv, og derfor er det litt skummelt, hvis en skal sammenligne det med å faktisk inkludere brukerne."

Henning

"Henry Ford sa en gang at hvis du spurte brukerne om hva de ville ha, så ville de svare en raskere hest, ingen ville tenkt på en bil."

Kristin

"..å bli mer ett eget medium som er knyttet mer opp mot det asynkrone som er post, og de andre korrespondansene som er der, ot vite mer om de, og være mer personifisert. Så er det egentlig bare å starte video. Jeg tror man kan sette det i samsvar med en epost korrespondanse. Altså, sender jeg deg en epost, ett dokument, og i den posten så har du en knapp som heter start videokonferanse eller telepresence eller noe. Som ett eksempel på at det ikke er start på en telefonsamtale, men egentlig bare eskalert fra ett medium til ett annet sin er likere sånn som vi ser det." Jens

"vi lærte på industridesign at kontrastene sort og hvitt stålte high-end"

Anders

"Litt forvirrende, men greit. Skjønner det vel etter ett par ganger."

Hedda

"Ikke veldig intuitivt, men forståelig. "

Martin

C.2.4 4.6: Psychic prisons

"Pil stråler kompleksistet og bør brukes med flere på linja"

Martin

C.2.5 4.8: Technological artifact as a frame

"Vi har hatt ett fokus på at produktene skal være ærlige, og da er det med veldig tydelig materiale ett viktig element. Det er lett å skjønne hva produktene er laga av, vi har ikke brukt plast som ser ut som noe annet enn plast. ...Ærlighet er jo litt av den arven vi har her i Skandinavia da. ... Med mye bruk av tre er liksom lett å lese. I tillegg så er det jo brukt mye metall og treverk, det er ett uttrykk for at en ønsker å være premium. Vi har jo tradisjonelt sett vært ett skamdyrt produkt, og da er det viktig at folk får den følelsen når de møter produktene, at de er eksklusive."

Jens

"Vi har bygget på det Skandinaviske formspråk. ... Enkle, rette linjer uten noe ekstra. Det er ikke noe snirkler, med mindre man må det. ... Premium er vel ett av nøkkelbegrepene som ble videreført."

Ida

T3 utstråler cash. Det var vel med fra starten av, old money. Kvalitet. Detaljer.

Henning

C.3 Chapter six

C.3.1 Expectation of functionalities

"Jeg savner lukkeknapper. Det å trykke utenfor rammen for å komme tilbake var jo litt merkelig, for hva gjør den da? Lukker den det, eller skjuler det, hva skjer?"

Sebastian

C.3.2 Genres of gestures

"Jeg prøver gjerne det som virker lettest. Jeg bruker Drag n' drop på pcen. Når jeg skal flytte elementer. Jeg tar tak og drar de inn i boksen jeg vil ha de i. I grunnen samme måte som når jeg rydder på iphonen min. Du vet, når ett spill går i spillboksen feks."

Sebastian

"Klikk gir jo ikke mening, det er ikke intuitivt, det er liksom ikke en bestemt handling, med mindre den skal åpnes. "

Sebastian